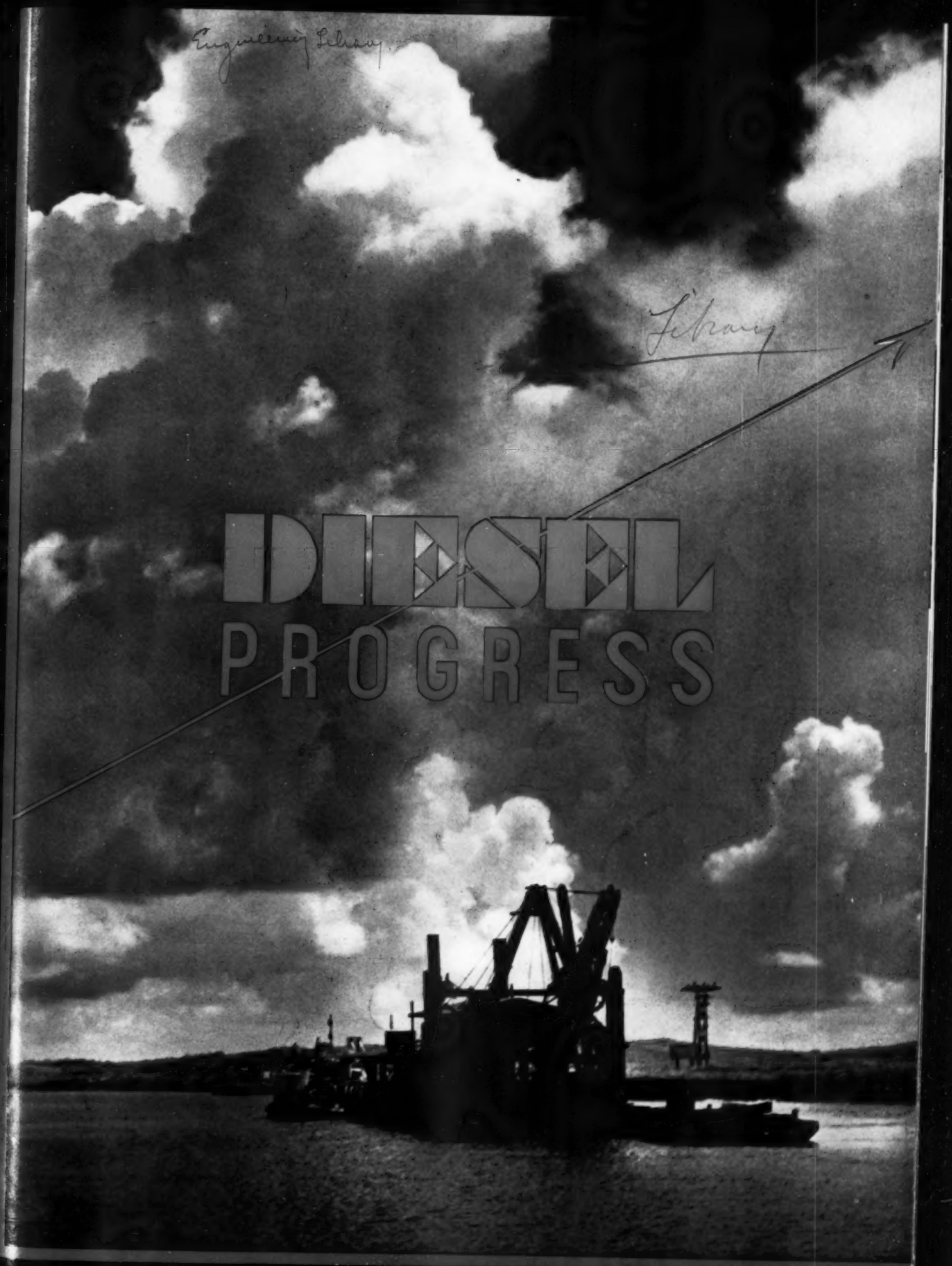

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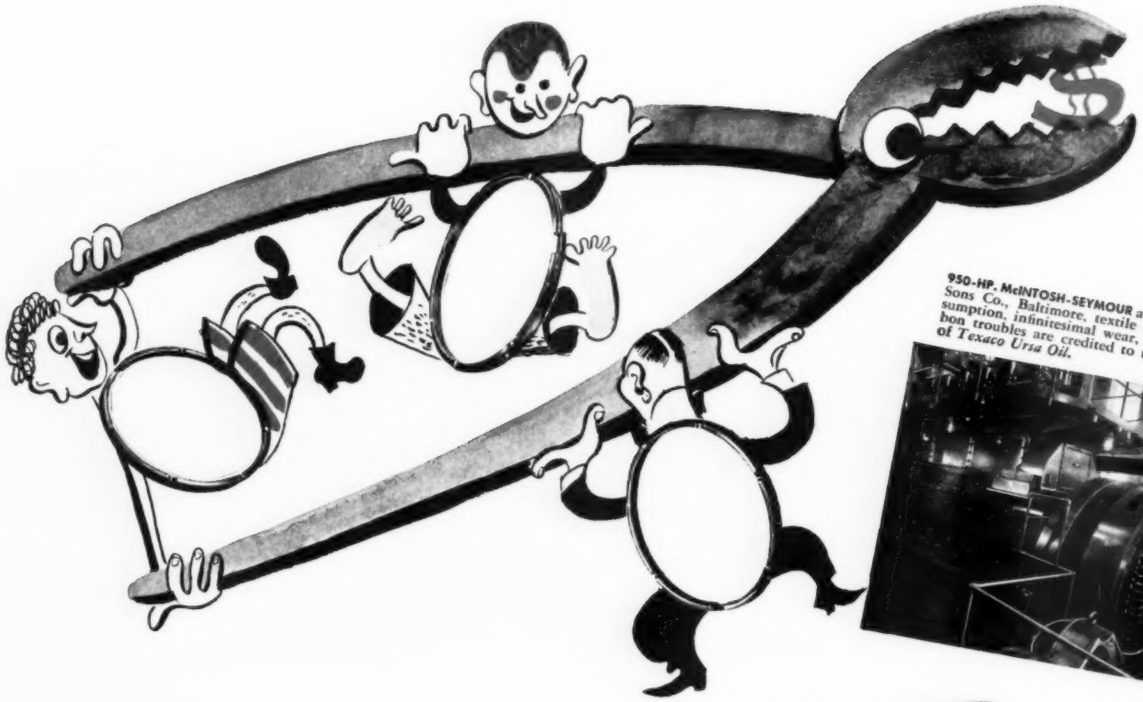

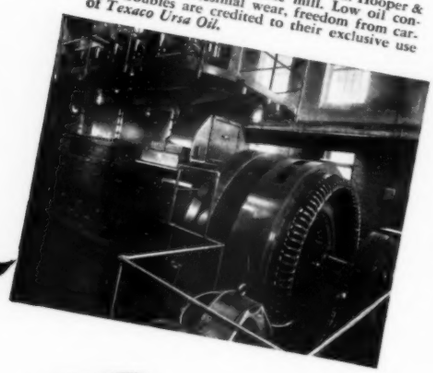

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THE U.S.S. "GUM TREE"

DIESEL and GAS ENGINE PROGRESS

REX W. WADMAN
Editor and Publisher

TABLE OF CONTENTS ILLUSTRATION: U. S. S. *Gum Tree*, one of thirty-two Net Tenders, Type YN, being constructed for the United States Navy. Marietta Manufacturing Company, Point Pleasant, W. Va., built the *Gum Tree* and three duplicates; American Ship Building Co. of Cleveland is building twelve; Commercial Iron Works, Portland, Oregon, four; General Engineering & Dry Dock Co., Alameda, Calif., four; and Lake Washington Shipyards and John H. Mathis Company, four each.—*Acme Photo*

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HEYWORTH CAMPBELL
Art Director

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CCA

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TWIN CITY ST

San Francisco—

Los Angeles

By CHARLES F. A. MANN

To meet steadily rising travel demands f
more frequent streamlined train service fr
California terminals, the Union Pacific-Nort
western and Southern Pacific Railroads plac
in service two newer, larger and finer "Cit
type streamlined trains, each with a three-u
6,000 hp. Diesel locomotive, and each bristli
with innovations both mechanical and esthet
which easily give them the titles of being t
World's finest passenger trains. Essentially, t
two new trains, "City of Los Angeles" a

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Features
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of wheel

This lovely young lady is pointing out the Mars oscillating secondary headlight which throws its light one-half mile on each side of the track.

One of the G.M.C., three cylinder, two cycle generating sets which supplies train lighting and auxiliary heating for two cars.

STREAMLINERS

"City of San Francisco", follow the same lavish plans of the last pair of "City" streamliners put in service two years ago, but with every modern improvement that a million miles of operation of previous giant-type Streamliners has developed a need for. The Diesel locomotives follow almost exactly the same design as their predecessors, both as to rated tractive effort and general design. Elimination of the oversize head end auxiliary power plant for train lighting and heating has reduced the total number of Diesel engines from eight to six large ones of 1,000 hp. each for main propulsion, and smaller units for a train lighting circuit, mainly auxiliary in character.

Features of the new trains are as follows: Use of dual Waukesha propane gas generating and refrigeration sets underneath each of the fourteen passenger cars on each train. Use of a new derailment flange cast on locomotive truck frames to prevent train leaving track in case of wheel failure. Truck simply drops to track and slides on the flanged casting, instead of jumping track. Complete interior decorative and upholstery effects achieved by use of synthetics and plastics, exclusively, for the first time on any piece of transportation equipment. Addition of club lounge facilities for daycoach passengers on "City of Los Angeles". Use of complete fluorescent lighting in club, lounge, dining, and chair cars. Use of electric dust precipitating system in air conditioning units, similar to Cotterell Dust Precipitators used on cement mills and smelters. Purifies air and removes dust electrostatically. Improved radio installation for passengers; electric brake-warning device; pneumatic door openers on diners; Polaroid glass club car windows, and many other mechanical gadgets to improve operations and give better passenger comfort.

The "City of Los Angeles" consists of the three-unit EMC Diesel locomotive, which carries 3,600 gallons of fuel and 600 gallons of lube oil, and the heating boilers and auxiliary generating sets; followed by fourteen cars consisting of the following in order named: baggage-crew dormitory; two day coaches seating 104 passengers; a cafe-lounge-kitchen car, with cocktail space for twenty-eight and dining space for twenty-four; main dining car seating fifty-six, with its own kitchen; club car, Hollywood, a riot of Movie Capital Modern Art, including barber shop, bar, and nurse's room. Following these cars are eight sleeping cars containing sixty-three varieties of Pullman bedrooms of every size and shape, plus a car full of open sections. The last car is an observation bedroom car, of the latest Pullman type. Power, coach, diner and lounge cars are all railroad-owned and the sleepers are Pullman-owned. The "City of San Francisco" is almost an exact duplicate of the "City of Los Angeles" except that there is no day coach lounge, and, instead, the coffee shop diner-kitchen car is articulated to a huge main dining car seating sixty-four, which has no kitchen. There is only one coach and instead an extra sleeping car is provided.

Mechanically the two trains are almost exactly the same, except that Timken and S.K.F. bearings swap places on the wheel journals and the whole interior decorative scheme on the "City of San Francisco" is more frosty and in keeping with the aristocratic temperament of Bay residents who are not used to the the Los Angeles-Union Pacific-Hollywood-Santa Fe riotous use of color and the newest in decorative treatment.

The new seventeen-car "City" trains replace the smaller and narrower thirteen car "City of Los Angeles" train and the former steam drawn "Forty-Niner", thus providing the two California terminals with streamliner service every third day. The Union Pacific-Northwestern system will operate the Los Angeles train and the same two railroads, plus the Southern Pacific, will operate the San Francisco train, while the "Forty-Niner" has been scrapped as an uneconomic venture that cannot compete with Diesel operation.

The Diesel power plants are each 209 ft. long and are of the typical EMC design, with two 12 cylinder EMC 2 cycle Diesels mounted in each of three cab sections, driving four traction motors mounted two each on the two six-wheel trucks. Cast steel wheels, hot journal alarms, electric retarding braking systems, safety derailment guides on each locomotive truck; a Mars figure 8 Safety Oscillating headlight, electric water pumps for spraying water against the wheels on long downgrades, automatic rail sanders for emergency brake applications, and the usual trunk line control and trunk line alarm systems for the engineer, together with engineer's deadman control and every comfort known for the head-end crew are all a part of the lavish equipment of the Diesel locomotives. These locomotives, operating on quick turnaround, have to turn out 20,000 miles per month or more. Hence every known device to facilitate trouble-free operation is provided. Flash type heating boilers and small Diesel generating sets for auxiliary train lighting are provided, as well as a full-length train telephone system for the crew's use and another line for passenger-steward usage.

Transitions from series-parallel-shunt are automatic. The generating sets in the second and third power units supply electricity for auxiliary train heating. Total weight, ready for operation, of the locomotives is 470 tons. Train car bodies are of fabricated aluminum alloy, weighing from 119,700 lbs. for the baggage-dormitory to 133,500 lbs. for the dining car. All underneath equipment on the cars is encased in a Monel metal shroud. Exterior rivets are countersunk and the cars are painted a bright yellow, mist gray and red striping with aluminum snap on mouldings. Perhaps the most unusual feature is the departure from central-station type of power for air conditioning and lighting and the use of a complete Waukesha propane gas power plant system. Under each car is a 7½ ton Waukesha ice machine, complete with direct connected 2 kw. generator for operating the fans; and a separate 7½ kw. Waukesha propane gas generator set, complete with starting battery. Each of the two sets is mounted on rubber vibration dampers and contains its own cooling system, and flexible fuel, water, electric and Freon refrigerant connecting lines to permit sliding out for easy inspection. The air conditioning units have self-contained dehydrator filters, heat exchangers, valves and evaporators, and filters, and can maintain a 76° inside temperature even if outside temperature is up to 120° F. While this self-contained car unit system increases the weight of the train, it also eliminates about 400 hp. of auxiliary Diesel current demand, and permits each car to operate when the locomotive is detached.

Thus, after seven years of streamlined trains, the cars are all non-articulated, completely separated individual coaches and the lighting and air conditioning is back to the old Pullman system of individual self-contained power units for each car, with the advantage of individual gas engined power independent of axle generated power, which requires the train be kept in motion most of the time. So far as the decorative treatment goes, needless to say, the last of all last words is needed to describe it, what with plastic furniture, photographic murals, Polaroid glass windows, Formica wall panels,

The commodious, comfortable club car on the "City of San Francisco".

Cab is equipped with the latest in sun visors, windshield wipers, deadman control, and acoustic tile soundproofing. Telephone has connection with the rear end brakeman.

Upper left: The new streamlined Diesel electric train "City of Los Angeles," rear view.

Beauty and comfort combined. Note roominess of both Pullman berths and floor space.

Leatherwall synthetic wall coverings, Sansiveria plants made of Lucite growing from silvered flower boxes; Plexiglas lens and side panels over the fluorescent lights; upholstering made of Nylon and Wool, and Saran plastic seat covers, and floor coverings made of wool and Tufton Rayon fiber. Some cars have Flexwood wall coverings besides. And every bit of interior finish is a new type of colorful, durable plastic base paint. Mandel Brothers of Chicago and Walt Kuhn of New York were responsible for this colorful railroad riot of home comfort.

Nobody has yet offered to do two more new trains with more special features, simply because there are no more gadgets invented to add to a set of streamliners, and it looks like the two new Union Pacific trains will hold the record for being the "World's Finest" for several years to come.

CASHTON WISCONSIN

By C. L. BRONSON

JUNE 23, 1933, was an eventful day in the village of Cashton, Wisconsin, for that morning the new Diesel Municipal electric generating plant was put into operation and the power company was disconnected from the local distribution system.

The Village of Cashton built its electric distribution system in 1909. Steam power was used and the plant was operated successfully from dusk to midnight for several years or until a demand for twenty-four hour service made the old steam equipment obsolete. A contract was then entered into with the power company for supplying the village with electric energy. The power company supplied the village for ten years and, in 1931, several citizens who were foresighted enough to visualize a municipal power plant, moulded the forms which, after two years of litigation, delays, court hearings and injunctions sponsored by the power company, led to the establishment of a municipal Diesel plant of which every citizen is proud.

Since the village already owned its buildings and distribution system, the only question to be battled was whether or not to buy Diesel engines and, after a very complete investigation as to the merits of a municipally owned plant, the Village Council, on May 6, 1931, awarded a contract to Fairbanks, Morse & Company for two Diesel engines, one a 140 and the other a 70 hp. engine, rated capacity of 137 kw., with direct connected exciters. There was no bond issue for any part of this equipment. The entire amount was paid in 72 installments of $405.00 each, plus interest at 6%, all out of the earnings of the plant. Although the contract was let in 1931, the installation was not completed until June 23, 1933, due to interference from the power company and its followers.

The entire well balanced and efficient plant is most impressive. The auxiliary equipment is arranged along the engine room walls, with all piping in a trench so that it is accessible for maintenance and repairs. The fuel oil system includes a transfer pump, connected to a pipe line running about two blocks to a railroad siding for unloading a tank car of 10,000 gallons in about two and one-half hours into one 15,000 gallon storage tank in the rear of the power plant. One day tank for each engine is in a concrete pit and equipped with a meter for keeping an accurate record of fuel used.

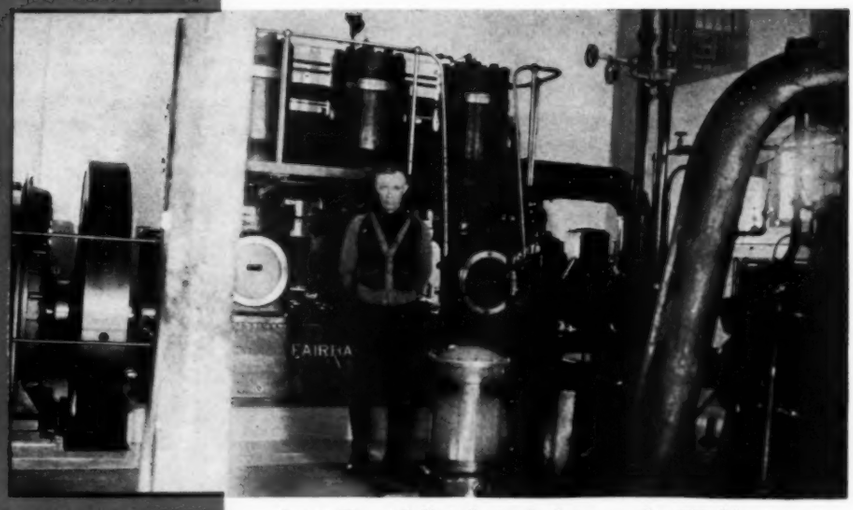
One Honan-Crane lubricating oil purifier was installed in 1940 which operates on both units. An Alnor pyrometer is used and exhausts are handled by Maxim silencers.

City water is used for cooling engines which is circulated through engine jacket with Fairbanks-Morse circulating pump. The water is treated with Graver Zeolite water softener. Water from the engines is circulated through two radiators and air is circulated with motor driven fans which are used in winter for heating the entire engine room, fire department and pumping station. During warm weather the air is drawn from the outside of building through the radiators by the same fans. This method can also be reversed and air drawn from the engine room during extremely warm weather, which will keep the temperature of the engine room normal and jacket water of the engines will never vary more than 15°.

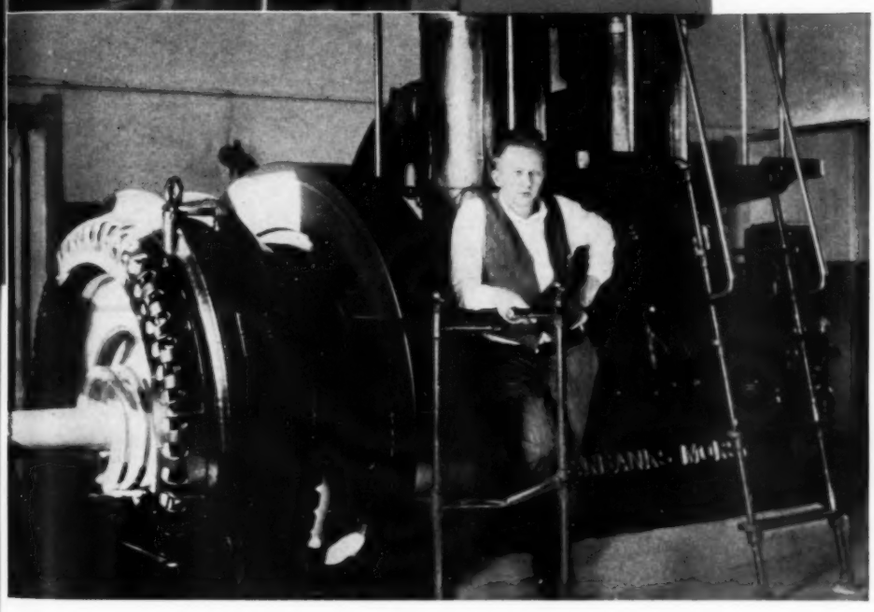
The switchboard consists of Jewel instruments and Westinghouse voltage regulator, one panel for each engine and a separate panel for the street lighting circuit.

In 1938, the contract was paid in full, as sufficient funds had accumulated over and above all other expense, leaving a reserve sufficient to retire the balance of the debt in five years instead of six as specified in the contract. During this time, rates had been lowered.

Now that the plant was entirely paid for the question arose as to what should be done with the surplus earning of the utility. After making a five year analysis of the load growth, it was deemed advisable to build up a fund for additional generating equipment as the commercial and domestic load showed a 15% increase for the past two years. A reserve of $500.00 per month was, therefore, set aside. In the fall of 1940, it was found advisable to buy an additional unit and a contract was let with Fairbanks, Morse & Company for one 225 hp. engine which was paid for in cash ninety days after completion of installation. It was also



Supt. Hans Kallestad stands between the 225 hp. F-M Diesel and a Honan-Crane refiner; two of the latter units are installed for the three engines.



Top view shows C. L. Bronson, Asst. Supt., and Mayor J. Sietz with the 225 hp. Diesel. Above: the 140 hp. Diesel and Mr. Bronson.

found advisable at this time to lower the rates, which led to a great saving for the citizens of Cashton.

The new unit is also equipped with Honan-Crane oil filter and Burgess intake air Snubber-filter and an alarm panel built by Diesel Specialties Company, a ten point Alnor pyrometer, direct connected alternator with V Belt driven exciter and Maxim exhaust silencer, with the same cooling equipment as used for the original units. Since the new engine was equipped with a Woodward Governor, a governor of the same type was installed on the old 140 hp. engine. One extra panel was added to the switchboard, all instruments being the same as on the original board, and one new G. E. Voltage regulator.

When the new unit was added, more space was needed and what was formerly the village jail was remodeled and turned into an office, so arranged that the operator in charge can view the entire engine room from the office through a large window. A most interesting and simple addition was also made by installing a shower bath. This was easily accomplished by running a 50 foot copper tubing in the exhaust pit of the 140 hp. engine and by use of a 50 gallon storage tank, sufficient hot water is at all times available—at no cost whatsoever. The entire interior of the plant has recently been repainted.

After a period of eight years, this small village, with a population of 700, has acquired a modern municipal light plant at a book cost of $45,988.49 which has been fully paid for without one cent of bond issue or special tax on the property owners, but solely from the earnings of the plant, in spite of two rate reductions. Present rates are as low or possibly lower than other villages in the community, regardless of size.

Men, as well as machines, have seen long service in and with the Cashton Municipal Light and Water plant. Jacob Seitz, Mayor for the past eight years, has participated in the plant policy-making at all times. Frank Schroeder, Christ Torkelson, Fred Anderson, Ole Aarness, Caspar Schaub, and Harold Stoll were faithful Councilmen during the siege of 1931-32-33 when the big fight was on. And last but not least, our 77 year "young" warhorse, Dr. C. H. Cremer, has always been a fighter for Municipal Utility ownership.

GULF SHRIMP FLEET

By WARREN GLEASON

BUYERS of the tasty jumbo shrimp, which is sold headless either iced or frozen in the northern and eastern markets, should realize that if it were not for the efficiency of the modern Diesel, in all probability these shrimp would not be offered for sale.

For jumbo shrimp to be caught in volume, they must be sought well off-shore, twenty to forty miles out, in deep water. Boats for this service are not the shallow-draft lugger-type familiar to casual visitors along the Gulf, but are larger boats, of deep draft, able to go to sea and stay there for a week or two and do their work in rough-water conditions. Over-all length of these trawlers ranges from about forty-five to sixty feet, beam averages about eighteen feet, and draft about five or six feet. This results in a bulky hull, a good sea boat but one hard to push without real power. Too, saving in fuel tank space is an asset. Altogether, it is significant that offshore shrimping had not been developed until Diesel engines had been made available for these craft.

The section around Morgan City, Louisiana, is the jumbo shrimp headquarters of the country at present. The basin of the Atchafalaya River offers safe anchorage and bases for fleets, transportation facilities for the marketable product. In the last few years, this basin has become the home for many operators with fleets of from four or five up to fifteen or twenty trawlers; many of these operators came from the east coast of Florida, where deep water shrimping was first practiced.

Probably the best known of these fleet-owners is John Santos Carinhas, better known as Captain John Santos, president of the Patterson Shrimp Company, a few miles upstream from Morgan City, Louisiana. John Santos, familiar for many years along Florida's east coast as "Kerosene John", to use his own words "did everything but cook" in this business.

Bottom: Some of the hundreds of trawlers and workboats of the Atchafalaya River section. Below: Left, Captain John Santos, President of Patterson Shrimp Company; right, Captain Cooner.

Originally coming to Florida in 1914 with the famous Captain Wesley Robinson as a hand for the menhaden business, John Santos was brought along solely to make and repair nets. Just a lad of seventeen, they told him he was too little to do the heavy work of menhaden seining; so John did it anyway. After two seasons he was made a skipper, the youngest captain in the menhaden fleets.

Gasoline was the customary fuel. But in one 34-foot boat was a 16 hp. 2-cylinder engine using kerosene. This was new stuff to local fishermen; nobody trusted the engine, everybody was leery of it. John Santos, never afraid of anything, took over the boat and ran it two years. His fame as an engine-magician spread widely; his success with the outfit gained him the "Kerosene John" tag which still sticks.

After his kerosene experience, John was convinced that heavy fuel had its possibilities. In his next boat, in 1920, he tried a fuel-oil engine. It would run awhile and quit; the performance being repeated *ad nauseam*. John diagnosed the situation as plain starvation; he remedied the matter by the simple expedient of punching a hole in the fuel-oil strainer. Maybe a little dirt got into the engine but so did the oil and the operation was successful. Other skippers followed his lead and fuel oil became popular along the Florida coasts. John's business increased, his fleet began to grow, and for even better results he began using Diesels.

In his present business at Patterson, Captain John owns twelve off-shore trawlers, all powered with Superior Diesels; he also operates a number of privately-owned trawlers, in half a dozen of which he has also installed Superiors. For the menhaden fleets, Captain John also has acquired two big menhaden boats, powered too with Superior Diesels. A modern off-shore trawler, Diesel-equipped and ready to work, costs around twelve thousand dollars; the menhaden boats several times this figure. Accordingly, it may be readily appreciated that "Kerosene John" has come a long way since signing on as a net-repairer back in 1914. A fighting spirit and sound judgment have had their reward; the availability of dependable power plants, economical of operation, has played no small part in the success of John Santos.

One of the "high boats" in the Santos fleet is the *Ray Shouvlin*, powered with a Model MRD 6 Superior Diesel of 170 hp., turning a 36 x 24 wheel through a 2 to 1 reduction gear. Other trawlers in the fleet with the 170 hp. engine are the *Bob Ramsey* and the *Doctor Guy*, of 59′ length and 17½′ beam. The *Bob Ramsey* uses a 2:1 gear, with a 36 x 24 Columbian wheel; the *Doctor Guy* swings a 44 x 34 wheel through a 3:1 gear.

The Model MRA 6-S Superior Diesel is used in a large number of Captain John's boats. The *Whoopee*, the *Big Apple* and the *J. J. Hanson*, all 46′ trawlers with a beam of 14′ and a draft of 5′, use this heavy-duty model with Joe's 2:1 gears, with 32 x 18 propellors. The *Captain John*, a heavier boat, uses this model with a 3:1 Joe's and a 38 x 28 wheel. Other Santos trawlers with the MRA 6-S are the *Johnnie Jr.*, with a 2½:1 Joe's and a 36 x 22 wheel; the *Rainbow* and the *Fighter*, both with the 2:1 Joe's and 30 x 18 propellors. The *Clementina* uses an 8-cylinder Superior, the MRA-8 of 150 hp., turning a 38 x 28 wheel through a 3:1 Joe's gear.

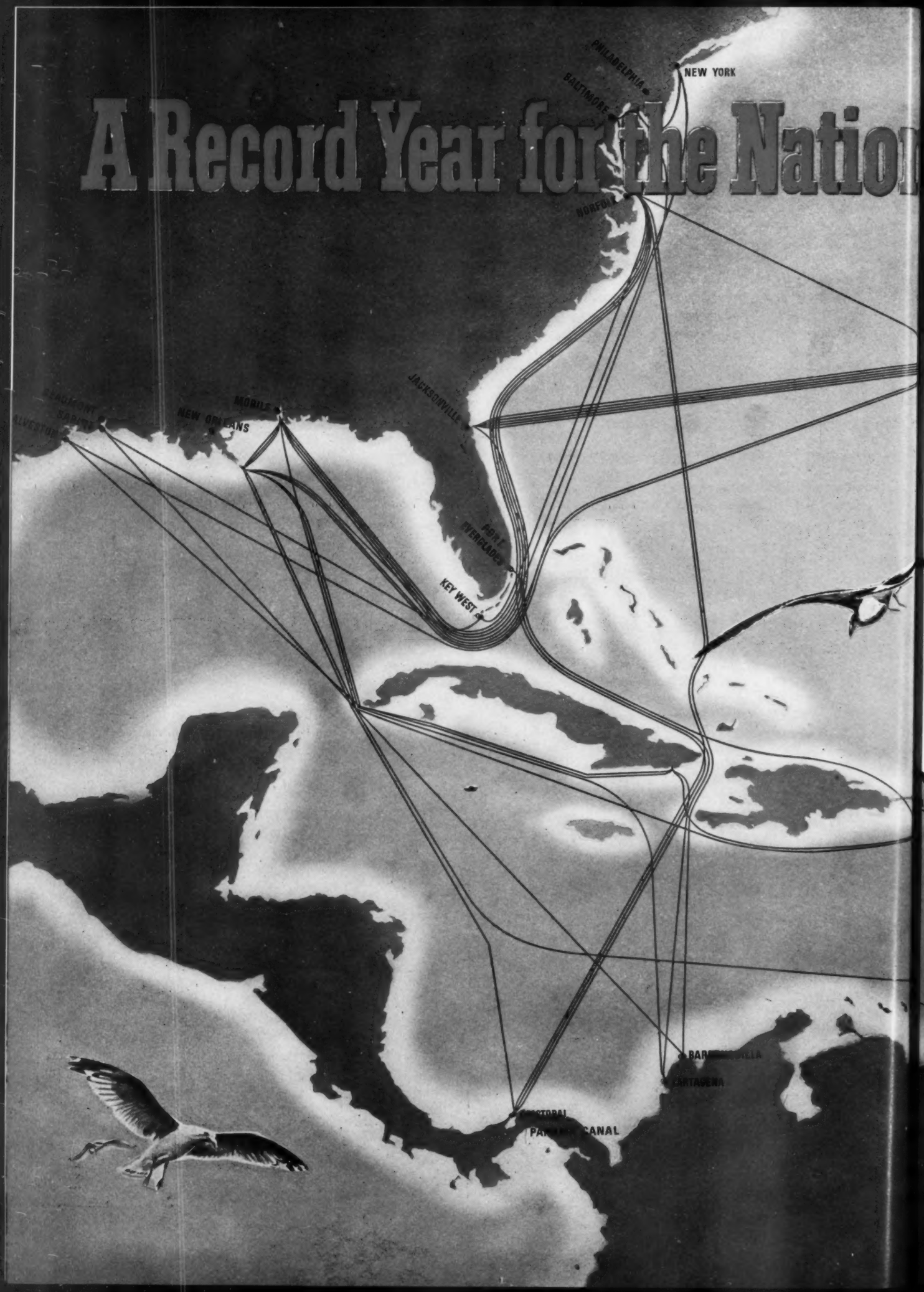
Four cylinder Superiors also power a number of boats for Captain John. The *Pappa Joe* uses the MRD 4, of 90 hp., which handles a 42 x 32 propellor through a 3:1 gear. The *G-Man* is similarly powered and equipped; reduction gearing being Twin-Disc. The *Tartar* and the *Arizona* use the MRA 4, of 62 hp., turning 30 x 18 propellors through Joe's gears.

So on through the trawling fleet. The Superior, developing its full power at 1500, is efficient propulsion for a deep-sea trawler when fitted with the proper reduction gear and propellor for the particular hull. The engines as installed use little special equipment. Starting is by electricity throughout, the generator also furnishing the little extra current needed for lights and ship-shore radio. Fuel and oil filters are all factory built-in; so for the most part are the heat exchangers, though in some of the latest Superior trawler installations a keel condenser gives good results.

As to details of operating and upkeep expense, little need be said. No man, especially one of the proven judgment of Captain John Santos, is going to buy Diesel after Diesel of the same make until he has over a score of them in operation unless average results are satisfactory. Observation of a large number of engines gives a far more accurate picture than details of an individual installation.

"G-Man" of the Santos fleet uses a Model MRD 4 Superior Diesel of 90 hp. with 3 to 1 Twin-Disc gear.

"Whoopee", 46′ trawler, powered with Model MRA 6-S, 100 hp., using Joe's 2 to 1 combination reverse and reduction gear.


A Record Year for the Nation
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BALTIMORE
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MOBILE
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CARTAGENA
CANAL

...MOST POWERFUL TUG!

...and its GM Diesel-Electric Drive

WHEN the Edmond J. Moran was launched more than a year ago, it was hailed as the most powerful towboat in the country.

It still is. But more important is the record way its GM Diesel power plant has been performing ever since, in 44,787 miles of the toughest deep sea towing as shown on this map of its chartered courses.

Day in, day out this powerful tug has been in constant service—towing more units than any other tug in America ever has in a like period of time—including trips to Bermuda, Trinidad and the Panama Canal—all in the interest of national defense.

Here, certainly, is a conspicuous example of the exceptional ability and reliability of a GM Diesel-Electric Drive. No wonder it's the first choice of the world's biggest towboat operators for the world's most exacting towboat jobs.

DIESEL ENGINE DIVISION
General Motors Sales Corporation, Cleveland, Ohio

EDMOND J. MORAN, designed by Tams, Inc. and built by Pennsylvania Shipyards, Inc. for Moran Towing & Transportation Company, has two main power generating units, each consisting of a Model 12-278, 2-cycle GM Diesel direct-connected to a 600-kw. D. C. generator, which deliver a total of 1,900 hp. Auxiliaries include two generator sets, each driven by a Model 3-71, 2-cycle GM Diesel.

PORT OF SPAIN

GENERAL MOTORS
DIESEL

Top view: The Vestaburg plant. Above: Control side of the new Worthington 1000 hp. Diesel and Ideal 700 kw. alternator.

VESTABURG, MICHIGAN

By DON CADY*

AN increasingly large number of rural homes in Michigan are enjoying the benefits of electricity generated by Diesel engines. Within the past few years, several REA cooperatives have built Diesel generating stations to serve their systems, while others have arranged to purchase electrical energy from municipal plants many of which have installed Diesel engines to handle the additional load. Detailed descriptions of many of these plants have appeared in previous issues of DIESEL PROGRESS as the respective plants went into service. To refresh the reader's memory, we are listing a few of the more important projects and the horsepower of equipment installed: Thumb Cooperative, Ubly, Michigan, 3000 hp.; Southeast Michigan, Adrian, Mich., 1100 hp.: Tri-County Cooperative, Vestaburg, Mich., 3500 hp.; Tri-County Cooperative, Eaton Rapids Plant, 1000 hp.; Tri-County Cooperative, Portland Plant 1375 hp.; Fruit Belt Cooperative, Cassopolis, Mich., 2010 hp.; Ottawa-Allegan REA, Burnips Corners, Gas engine; A new project involving 1785 hp. of Diesels, located at Scottsville, Michigan, went into service during this summer. These projects are mentioned in connection with this article on the Vestaburg plant as there is no intention of implying that any one plant is more successful or more outstanding than others. Each is rendering a valuable and dependable service in its particular area.

The Vestaburg plant of Michigan's Tri-County Electric Cooperative is a fine example of Diesel engines producing electricity economically for rural consumption. This plant went "on the line" in May, 1939, with three 500 hp. Worthington Diesels. The original plans provided for a fourth engine as a future expansion, and space was provided in the building for such a unit. The expansion program was begun

*Chief Engineer, Vestaburg Plant of Tri-County REA Cooperative.

almost as soon as the plant began producing current. In September, 1939, a 1000 hp. Worthington Diesel was installed in the space provided for the fourth engine.

The load continued to grow rapidly and it soon became apparent that the plant would have to be expanded. The engine room was extended to house a fifth unit which was placed in operation June, 1941. The fifth and newest unit consists of an eight cylinder, 16″ x 20″ Worthington Diesel engine direct-connected to a 700 kw. Ideal Electric alternator with a 15 kw. V-belt driven exciter. Thus, the generating equipment presently consists of three 6-cylinder 500 horsepower engines and two 8-cylinder 1000 horsepower engines of the same make and general design. The 500 hp. engines have a smaller cylinder than the 1000 hp. engines. The number and capacities of the units permits the economical selection of units in service to handle the load with a high running-engine-capacity-factor.

This plant is known as the Vestaburg plant due to its being located adjacent to the village of Vestaburg, Michigan; also this designation is made to distinguish it from the other plants serving the Tri-County system. Other plants which are a part of the system include Diesel engine plants at Eaton Rapids and Portland, and a number of small water turbines located at various points.

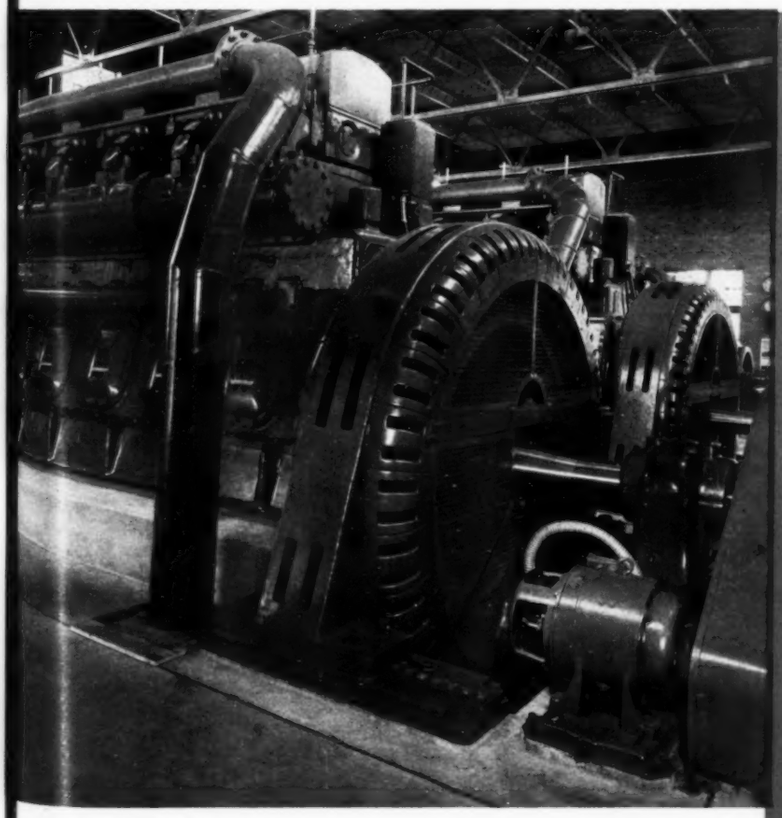
The story of the inception and early growth of the Tri-County Electric Cooperative was carried in the April, 1940, issue of DIESEL PROGRESS; however, since that date the number of customers has increased to more than 4500. A business-like merchandising and load-building program has resulted in a high per capita use of current, reducing the cost of producing the power and increasing the number of services performed by electricity in the average home.

An evaporative condenser type of cooling unit is provided for the engine. The compactness and flexibility of this type of engine cooling has been well established at this plant where it has been used on all of the previously installed engines. The evaporative cooler is located in the engine room at the control end of the engine and adjacent to the outside wall of the plant. The air for the evaporator is taken in through the outside wall at a point about three feet above ground and, after passing through the unit, is discharged out through the wall at a point some five feet directly above the intake. A full flow of soft water is supplied to the engine at all times. The temperature of the soft water circuit is controlled by regulating the quantity of air and water passing over the coils.

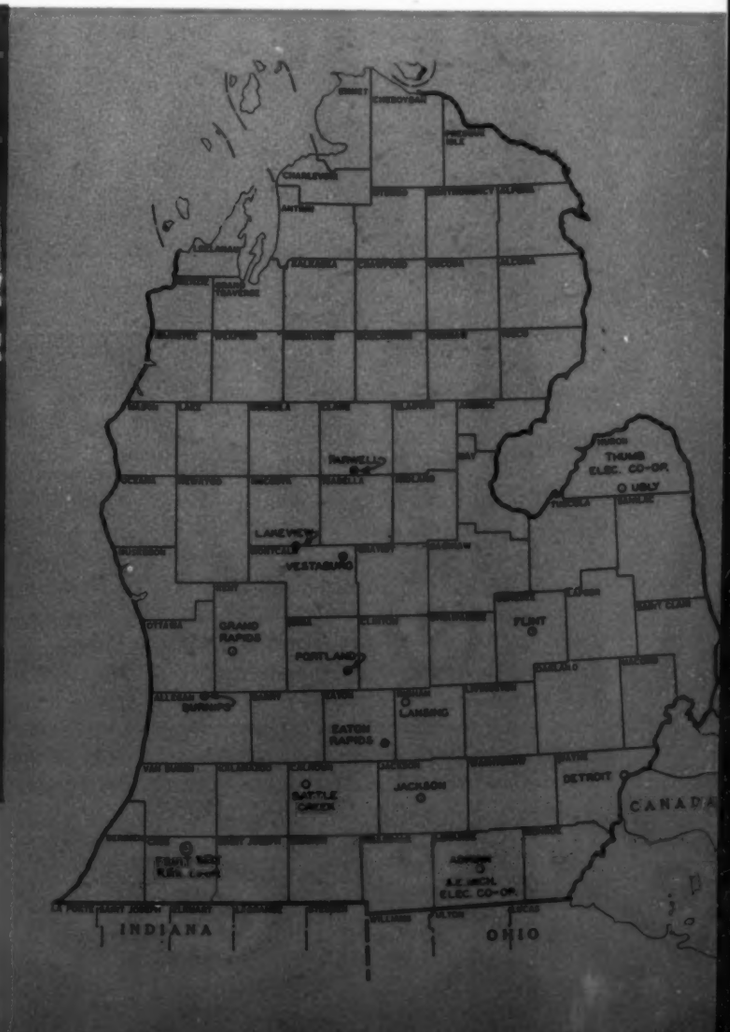
This system works very satisfactorily even in sub-zero weather, and has the advantage of being located completely within the engine room. The plant operators are fully aware of the advantages of circulating copious quantities of warm jacket cooling water and maintain inlet temperatures of 120° F or higher with outlet temperatures of about 130° F.

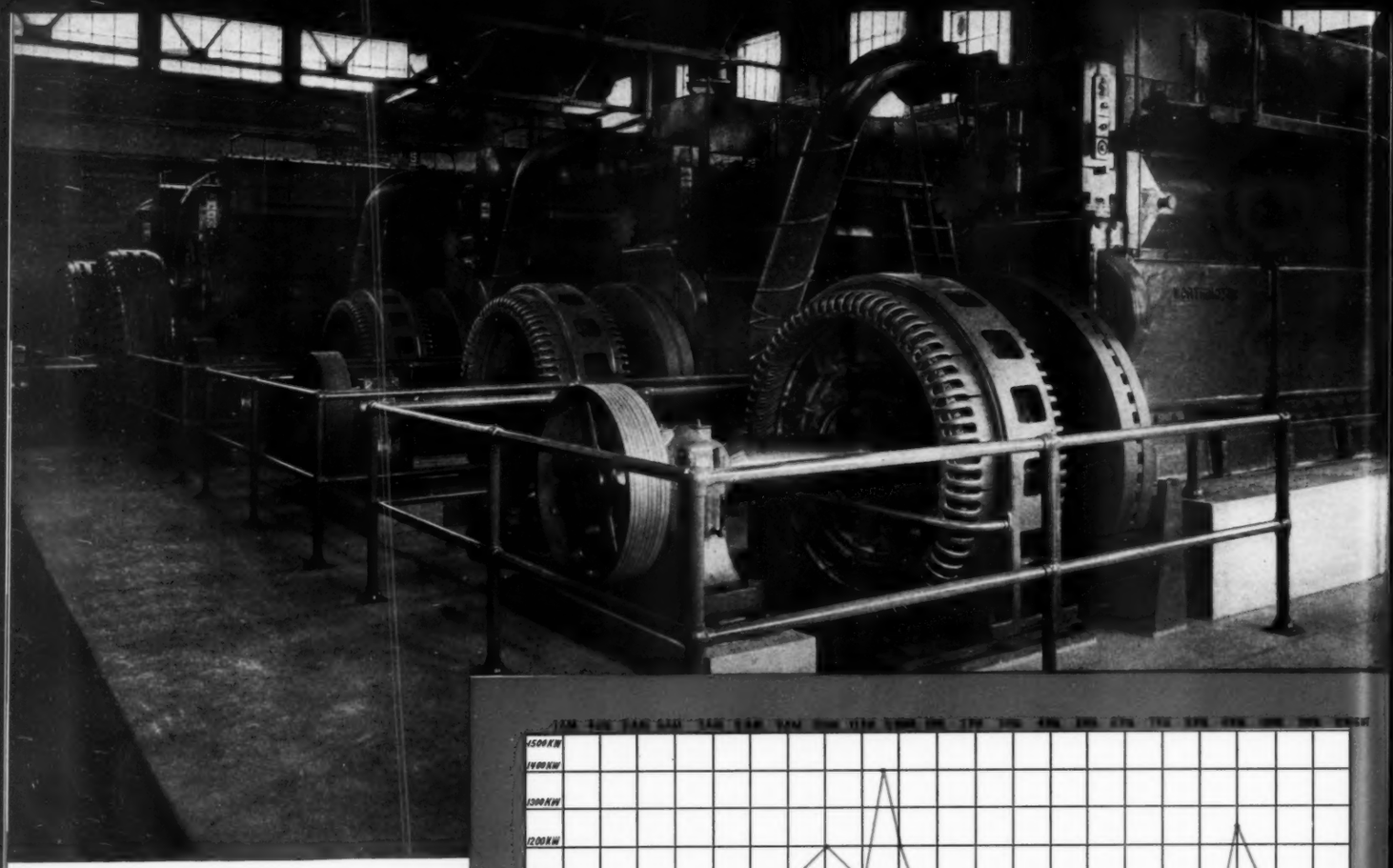
Due to its availability and inherent low pour point, a Michigan gas oil is used as fuel in all engines. The fuel is stored in outdoor above ground tanks and is subjected to cold weather which precludes the use of a heavier fuel. In spite of the fact that this gas oil weighs only seven pounds per gallon (about 37° API gravity), the plant has averaged 12.1 kilowatt hours per gallon during the past year. Its consumption of lubricating oil has been equally remark

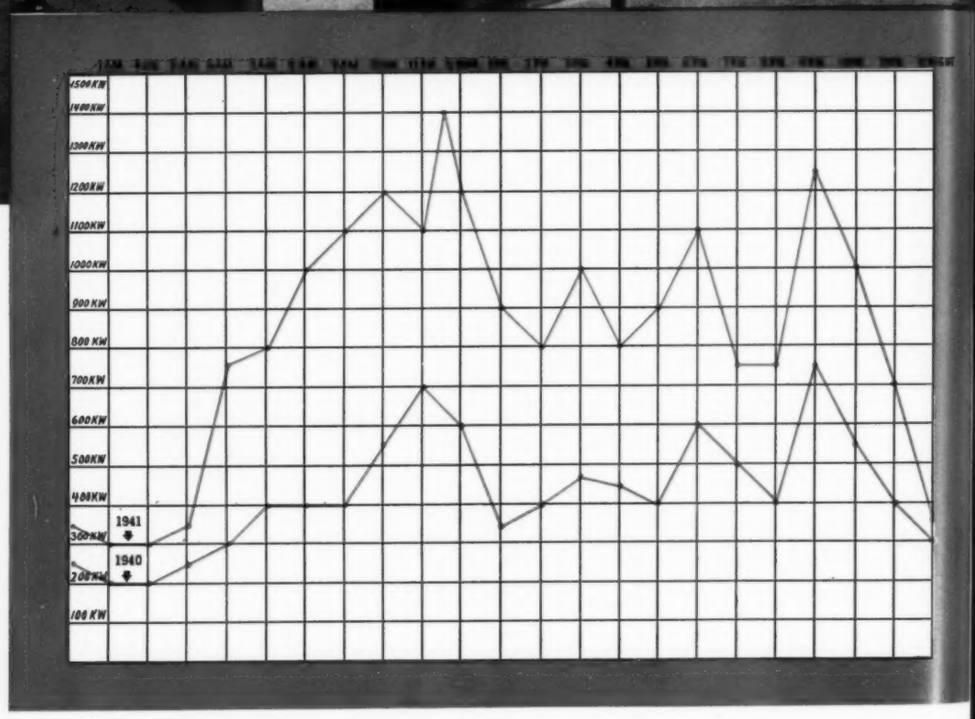
Exhaust side of the newest Worthington Diesel.



The Tri-County Electric Cooperative of Michigan now serves thirteen counties.







Above: General engine room view showing five Worthington Diesels totaling 3500 hp. at Vestaburg. Right: Curves show growth of load over a period of one year.

able as the average for the past year has been 2346 kilowatt hours per gallon which, with a running plant capacity-factor of 70%, would mean 5000 rated horsepower hours per gallon. For the twelve-month period ending July first, this year the plant generated 3,781,400 kilowatt hours at an operating cost of only 4.75 mils, and an overall cost including taxes, interest, maintenance and depreciation of 8 mils. This power has been sold to consumers who previously were not connected to any power system, public or private. This is in keeping with a policy established by the Tri-County Cooperative during its inception that it would not enter the competitive field, but that it would confine its service to those areas not accessible to electric service from other sources. During the recent building expansion required to house the new engine, space for a tool and store room and a garage for line trucks were added to the rear of the plant building. The capacity of the sub-station was increased from 1500 kw. to 2250 kw. in order to handle the output of the plant as the load grows.

Other auxiliaries and equipment installed with the new engine include: the alternator and exciter, Ideal Electric Mfg. Co.; isochronous governor, the Woodward Governor Co.; Alnor exhaust pyrometer, Illinois Testing Laboratories; evaporative cooling equipment, Buffalo Forge Co.; air intake and exhaust snubbers, the Burgess Battery Co.; Talpa lubricating oil, Shell Oil Co.; circulating pumps, Worthington Pump and Machinery Corporation; and switchboard instruments by Westinghouse, General Electric, and Sangamo.

The 600 hp. Diesel Tug "Chipola" on trials off New Orleans.

DIESEL GULF TUG

By WARREN GLEASON

THE Coast Transportation Company, Inc., with headquarters in the Board of Trade Building, New Orleans, is in the business of handling coastwise shipments of general cargo between ports along the Gulf of Mexico. As the company has been successful in serving the gulf ports as far east as Appalachicola, Florida, Mr. Theodore Brent, president of the organization, decided to increase its field of operations. Accordingly a new and able sea-going tug has been added to the fleet. As Diesels had already proved satisfactory both from a mechanical and monetary angle, the new tug is also Diesel-equipped.

Similar in design and specifications to the tugs recently commissioned for the W. G. Coyle Company and to others being built for the U. S. Navy, the *Chipola* is 80 ft. in length with a beam of 20 ft. and a draft of 10 ft. Construction is of steel throughout, with respect to both hull and lower and upper deckhouses, and is an entire arc-welded job.

Like the above-mentioned tugs, the power plant is all-Diesel both for propulsion and auxiliary machinery. The main engine is a Superior Diesel, eight cylinders, 12¼" bore, 18" stroke, developing 600 hp. at 400 rpm., turning a three-blade Ferguson propellor of 68" diameter and 38" pitch. No difficulty is encountered in swinging this wheel at a productive speed. In fact, the Superior engine has been operated for considerable periods on test runs at speeds as high as 425 rpm.

"Gulf" fuel oil is used, with "Gulf Parvis H" for lubrication. A Purolator filter delivers clean fuel oil to the Diesel and a Nugent filter protects the lubrication. Lube oil is cooled by a Ross unit, and a Ross heat exchanger is included in the closed circuit fresh water cooling system. Gouids pumps are installed for fuel oil transfer and for supplying cooling water. The main engine is equipped with a Koppus intake air filter. Exhaust temperatures are indicated by the Alnor Pyrometer. A Maxim spark-arrester silencer muffles the exhaust.

The auxiliary engine is also a Superior Diesel, rated 25 hp. at 1200 rpm., and is connected to a 10 kw. generator, and a Worthington compressor which supplies starting air for the main engine. Starting batteries are Exide, of 24 volts.

Chipola will be used for long off-shore trips, towing a pair of barges of approximately 1000 tons each across the Gulf between New Orleans and Tampa and Miami, Florida. The new tug was constructed by the Avondale Marine Ways, Inc., just across the river from New Orleans.

SOMETHING REALLY NEW IN DIESEL TRAINS

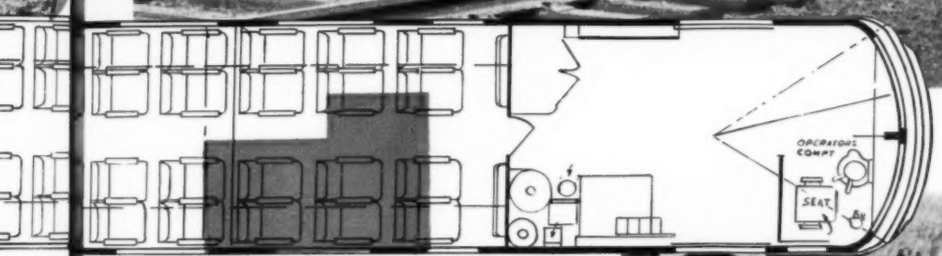
By REX W. WADMAN

SOMETHING really new and different in streamlined, high speed Diesel trains went into service in September on the Denver & Rio Grande Western Railroad between Denver and Salt Lake City. They christened them the "Prospectors" and well they might because they blazed a new trail in the adaptation of light weight, high speed trains and Diesel engines to passenger service.

Each train consists of two self-powered cars, one a day coach, the other a sleeper with compact combination dining car and lounge in the rear. Each car carries its own self-contained power plant mounted under the floor, as indicated by the diagram, the red spots indicate the location of the two Diesel units (the same power plant layout applies to both cars). These power plants are so mounted that they can only be serviced from *under* the cars. In other words, they have to run or else, which speaks worlds for the dependability and the reputation for continuous service which Diesels have so well earned in railroad service. The four power plants, two under each car, for these trains consist of Hercules DXFD six cylinder 5½" x 6" flat type Diesels rated at 193 hp. at 1600 rpm. fully described and illustrated on pages 215 to 219 of the sixth edition of the DIESEL ENGINE CATALOG. Electrical equipment is General Electric, which company also supplied the amplidine and normalizer. The normalizers maintain normal air pressure for engine operation regardless of altitude. A butterfly valve, governed by linkage to a Sylphon bellows charged to a pressure of two lbs. above normal sea level atmospheric pressure, controls operation of the normalizer. The route over which these two trains operate subjects the engines to severe changes in altitude, hence the necessity for some form of supercharging to compensate for the rather violent fluctuations in atmospheric pressures. When these trains pass through the famed Tennessee Pass of the Continental Divide, they are 10,250 feet above sea level. The Edward G. Budd Manufacturing Company of Philadelphia built these two trains and poured into them their accumulated experience gained in the building of so many of the outstanding light weight, high speed trains now in service. These two trains each have a capacity of 62 passengers. The first car is laid out with the control cabin forward which, in effect, is set into a corner of the baggage and mail car compartment, then comes the reclining seat section, with accommodations for 44 passengers, with large dressing rooms in the rear. The second, or rear car provides sleeping accommodations for eighteen persons in eight upper and eight lower berths and two chamberettes. A connecting door is provided between the two chamberettes, thus permitting them to be combined into a single room of drawing room size. In this rear car, aft of the sleeping compartment section, comes the compact yet highly efficient kitchen and bar, serving an adjoining dinette with table sittings for eight. Rounding out the interior design is a four seat observation lounge. Each car is 75′ in length and weighs approximately 130,000 lbs. ready to run. These new trains are now operating overnight, every night between Denver and Salt Lake City, replacing two standard combination pullman and day coach steam operated trains. It isn't difficult to figure out what a tremendous saving there will be in operating expenses, in time, and what a big increase there will be in passenger comfort with the addition of the two "Prospectors" to the equipment of the Denver and Rio Grande Western Railroad. The operation of these two trains will be watched with more than the average interest. If they are successful, if they make money, if they operate with a minimum of maintenance and outage, then a huge market becomes available for similar equipment. These cars are cheap to build, cheap to operate. They are self-contained, each car carrying its own power plant, which makes it possible to build up trains of considerable length, as long as the train consists of cars all of this type. Immense possibilities for developing passenger traffic in sections where it has practically disappeared now arouse the imagination of many passenger traffic managers. In effect, these two "Prospectors" are but glorified railcars insofar as their cost, adaptability and operating efficiency are concerned, but these new cars are a big step ahead of the old railcars. More powerful, tremendously improved passenger accommodations, faster, better looking, but still railcars from an operating standpoint, easily transferred from one line to another, from one branch to another. Easily operated, easily serviced, easily handled. The "Prospectors" are blazing a new, untrodden trail, adding to the prestige of Diesels on the railroads.

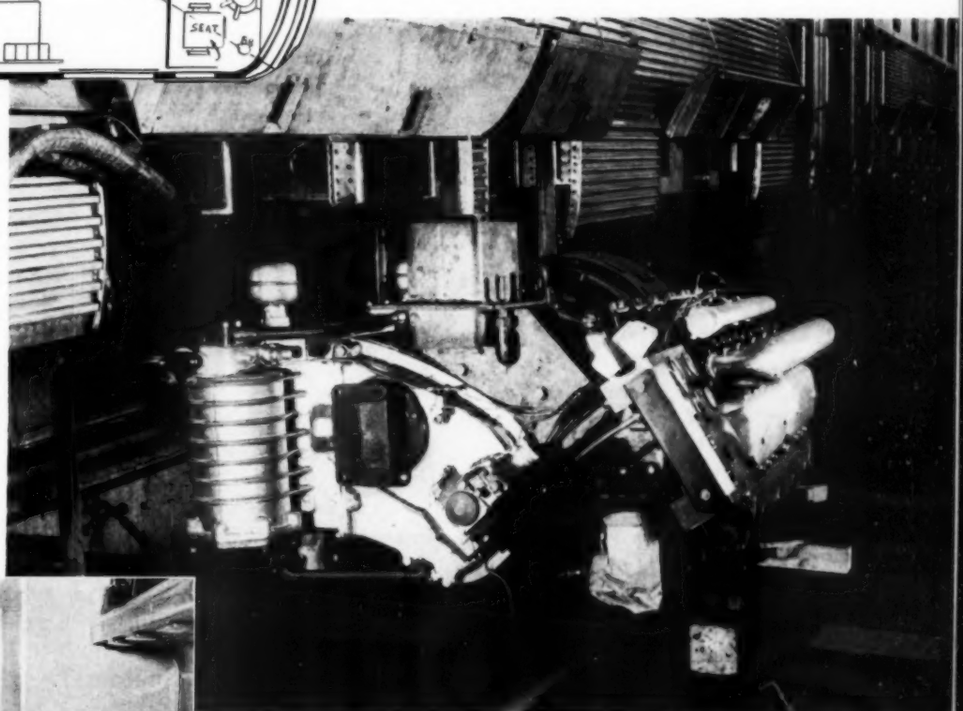
Frank Edward Gimlet, seventy-six year old gold prospector of Arbor Villa, Colo. who christened the first of the "Prospectors".

Floor plan of the first of t two cars, showing location the two Hercules Dies



The "Prospector" on the trial trip between Jersey City and Trenton, N. J.

One of the two Hercules Diesel engine plants which are installed under the floor of each car. Access to these power plants is from under the car only.



A part of the reclining seat section of the forward of the two cars comprising these trains.

SWIFTWATER DIESEL TOWBOAT

By CHAS. F. A. MANN

WITH a great battle going on for lower freight rates to the Inland Empire area of eastern Washington and Idaho, the growth of river transportation for bulk petroleum products is no less than startling.

With the Columbia River above Portland, Oregon, now accessible to even the weakest type of river power, for 100 miles inland to the end of Bonneville Pool, above Bonneville Dam, and another 200 miles inland toward Umatilla Rapids and Pasco, in the wilder, swift waters of the Mid Columbia, the development of peculiar ship types designed expressly for quick navigation of swift river waters is keeping pace with the growing traffic in petroleum.

A type of tug has been adopted for The Dalles-Portland portion of the run and a type for The Dalles-Pasco-Umatilla Rapids section. A neat barge type suitable for both stretches carries petroleum all the way through. A new type of steel, fully covered wheat barge has been developed to serve as running mate for the three other ship types.

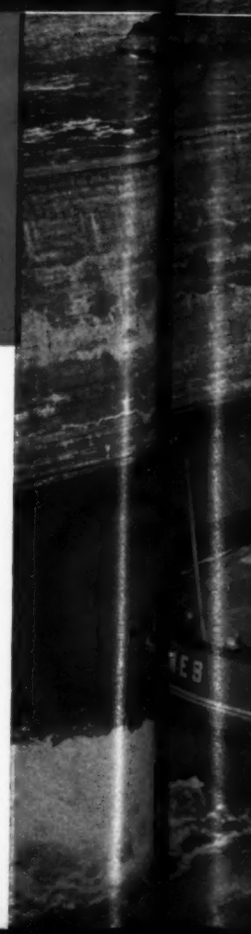
The way it works now is a full petroleum barge and an empty wheat barge comes up to The Dalles with a small tug for power. There a big powerful swiftwater tug carries the empty wheat and full petroleum barges upstream to Umatilla, Oregon, and Pasco, Washington. Downstream the petroleum barge is empty and the wheat barge is full. A full load both ways on clock-like schedule.

Now comes a new type of development, with a new combination wheat and oil barge, and a smaller type of powerful tug for use on the Mid-Columbia.

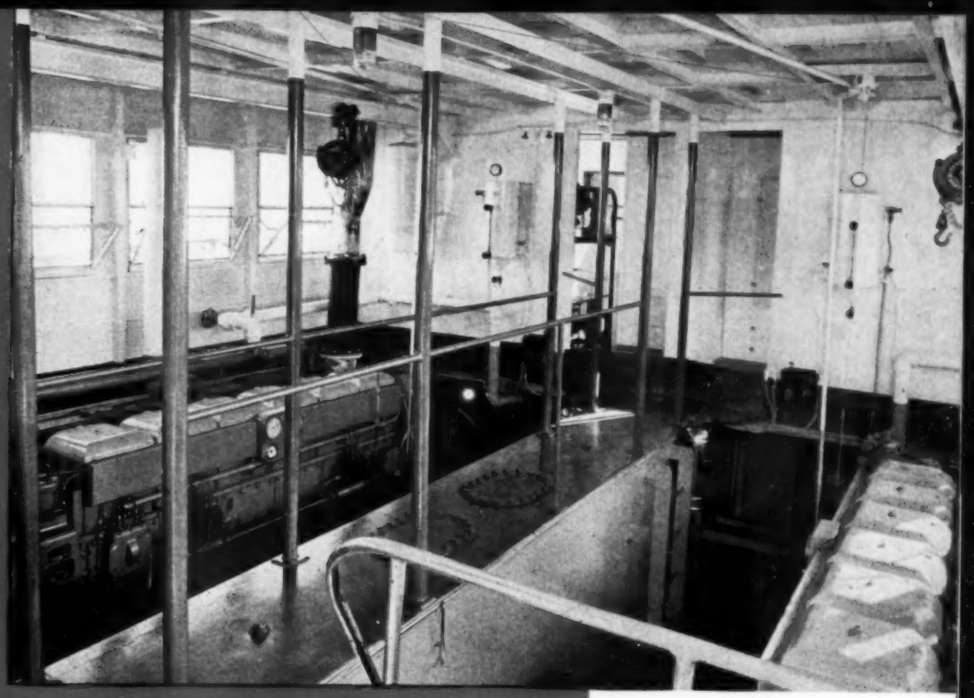
This pair is headed by the new swiftwater tug *Capt. Al. James,* completed during the recent spring high water at a new shipyard near the mouth of the Snake River, below Pasco, Washington, which lies at the very bottom of the vast Columbia Basin desert.

The new tug and the companion barge are almost exactly the same hull dimensions. The tug is 81′ x 26′ x 4′ draft and the barge is 84′ x 26′ x 4′ 6″ loaded draft. Both vessels were built by the Steel Construction Company, a subsidiary of the Shaver Forwarding Company of Portland, Oregon, which also owns the two new vessels. Both were designed by L. S. Baier. The *Capt. Al. James* is powered with two Cooper Bessemer direct reversing, 4 cycle Diesels, developing 520 hp. each at 700 rpm. Timken roller thrust bearings, American Bosch nozzles on the Cooper Bessemer patented fuel injection system, Curtis 2-stage air compressors; Western Electric tachometer in engine space as well as pilot house, Cuno oil filter and Purolator fuel filters are all part of the equipment. Full pilot house control and pneumatic rudder are provided.

The towboat carries two 50 inch propellers, which normally are run at only 550 rpm., leaving some speed to spare for the various rapids along the Celilo Canal-Umatilla portion of the route. Her top speed is thirteen knots in slack water. L. S. Russell heads the Shaver Forwarding Co. at Portland. Capt. Floyd Peck is the skipper of the new tug.

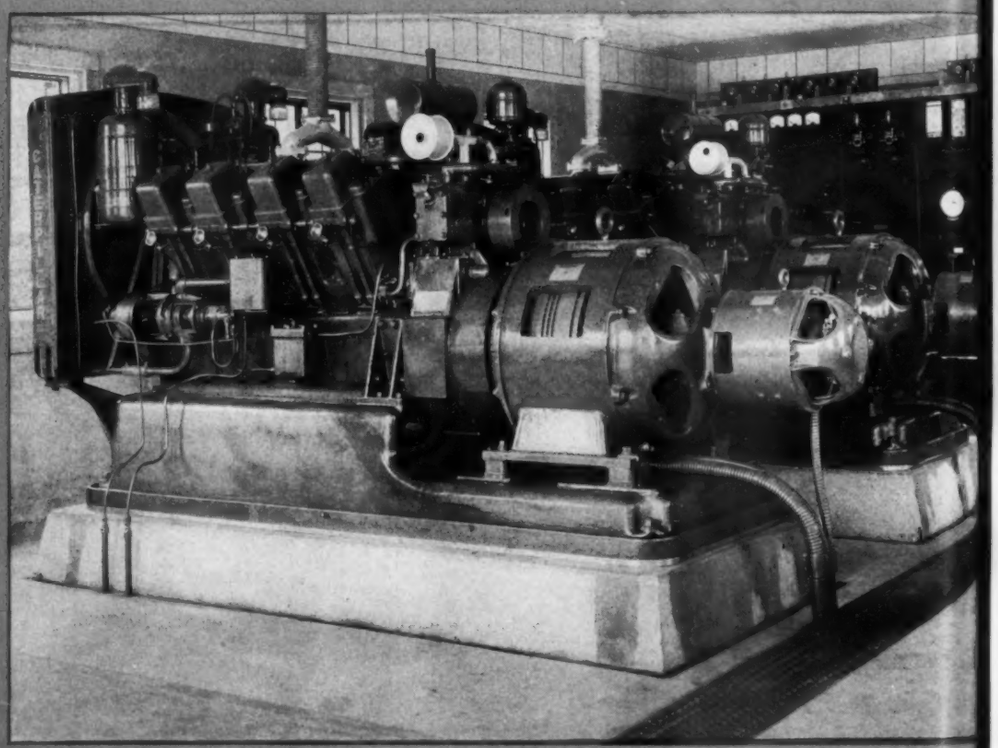


Above: "Capt. Al. James" and new barge in Columbia River near Umatilla Rapids, Oregon, and, right, in Middle Locks, The Dalles, Oregon.



View from upper engine room showing the two Cooper-Bessemer main Diesels and centerline fuel tank.

Above: Old Faithful Camp, Yellowstone National Park. Below: Two Diesel generating units that supply current for all services in this extensive camp.



OLD FAITHFUL CAMP IN YELLOWSTONE PARK

WITH "See America First" an enforced slogan for tourists this year, our country's great national parks and scenic wonders are having a tremendous season. Thousands of persons, who visit Old Faithful Camp at Yellowstone National Park in the northwest corner of beautiful Wyoming, gasp with wonder at nature's phenomenal displays—and rightfully so—but at the same time few pay particular attention to man-made wonders that help them enjoy life in the "wilds." For instance, many stop to seek an explanation for the electric lights at Old Faithful's stores, the Government Ranger Station, the museum, C. C. C. Camp and studio. Two Caterpillar Diesel electric generating sets provide lights and power for stores, C. C. C. Camp, swimming pool, ranger stations and other government buildings at Old Faithful. They are in action around the clock, and at an altitude of 8,000 feet above sea level. Each engine uses about six gallons of seven-cent fuel per hour. Yes, the natural wonders of Yellowstone are among the world's finest. And now we moderns may view them in comfort.

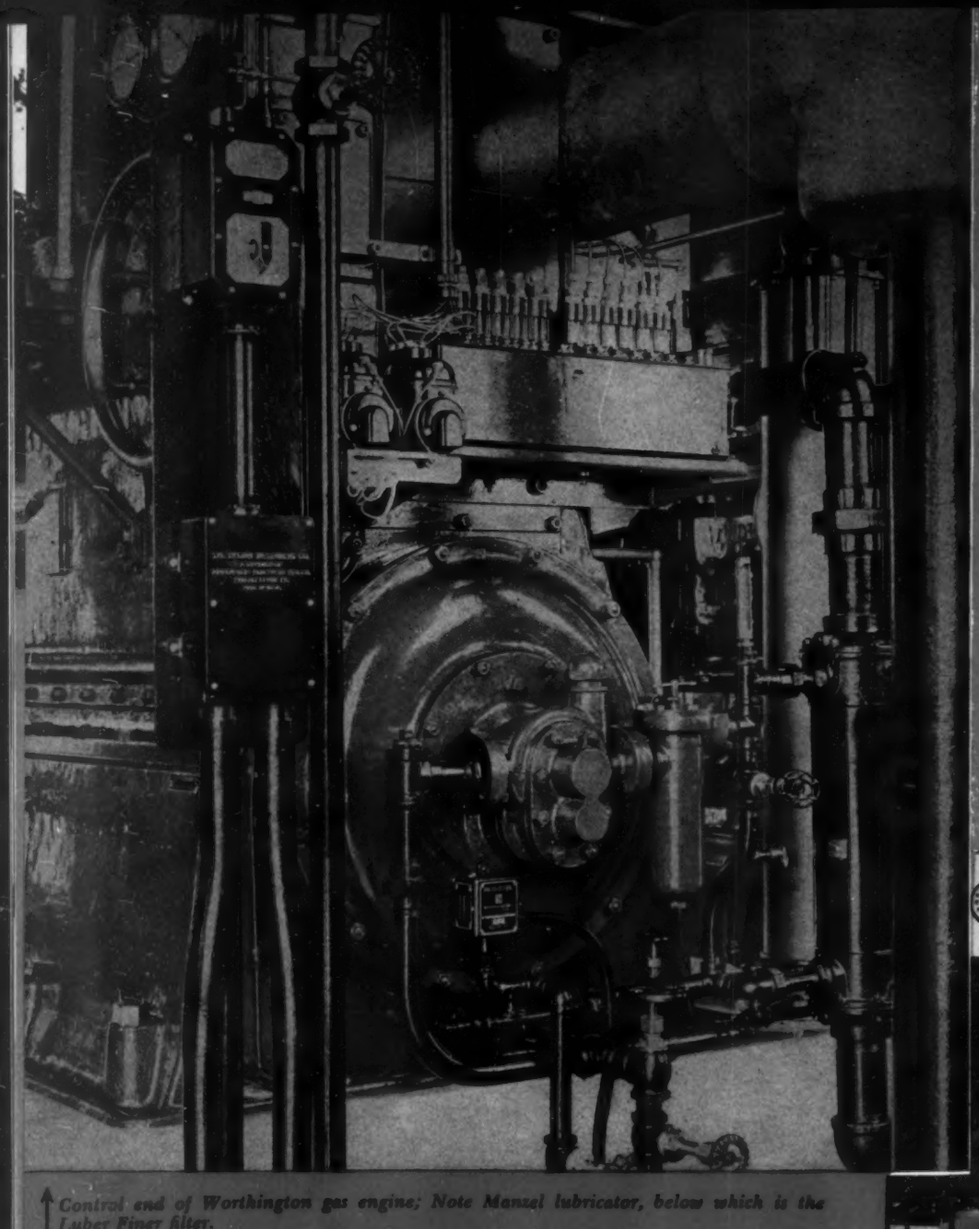
DOMINQUEZ, CALIFORNIA WATER DISTRICT

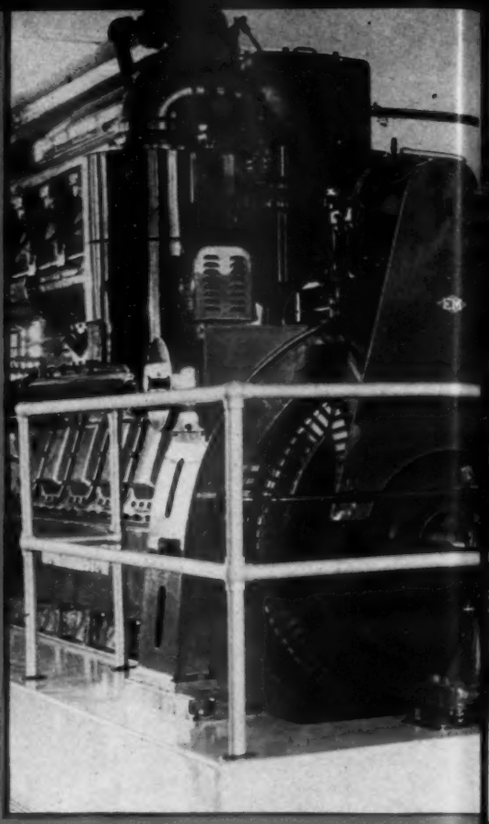
By JIM MEDFORD

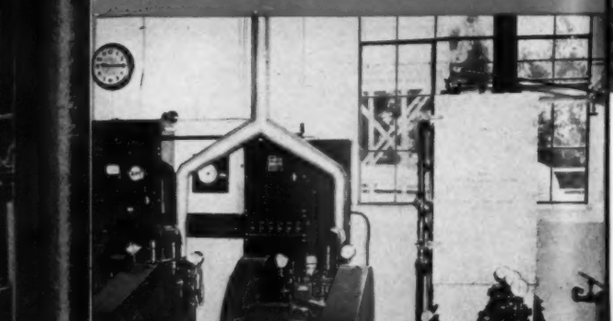
THOUGH the year 1911 marked the beginning of the "modern" history of Rancho San Pedro, one of the Old Spanish Land Grants, its ownership by the Dominquez family headed by Don Juan Jose Dominquez dates prior to 1790 the year Don Juan Jose built the original hacienda "casa de adobe" northeast of Dominquez Hill out of native clay, and timber from the San Gabriel Mountains. This rancho of over 20,000 acres is the site of some of the finest producing oil fields in Southern California, one ten-year-period's production being $1,832,897.65. To serve this vast industry, also the various communities sprinkled throughout the rancho, and to irrigate the thousands of planted acres, is the function of the Dominquez Water Corporation owned by the Dominquez Estate Company. Located a few miles south of the City of Compton in Los Angeles county, the original steam plant was built in 1911 and electrical equipment added in 1925. This dual energy served the district until January of the present year when installation of natural gas engines was completed. Their addition doubled the plant's capacity to a daily total of 24,000,000 gallons. The steam unit of two Sterling type Babcock Wilcox water tube boilers natural gas fired with oil as standby fuel driving a like number of Prescott cross compound 150 pounds steam pressure pumps is now maintained for standby service. Water delivery is through high and low pressure pipe lines of approximately seventy-two miles.

The installation of three Worthington gas engines, Model CCG, 6 cylinder, 12¼" bore 14½" stroke, direct connected to 50 cycle, 3 phase, 480 volt alternators with multiple-belt driven package design 7½ volt exciters mounted on housings, each engine rated at 385 hp. at 428 rpm., air starting and equipped with synchronous governors insuring automatic constant speed of alternators, completes the modernization of the Dominquez Water District begun thirty years ago.

Engine starting air is supplied by a gasoline generator set and motor driven two-stage air

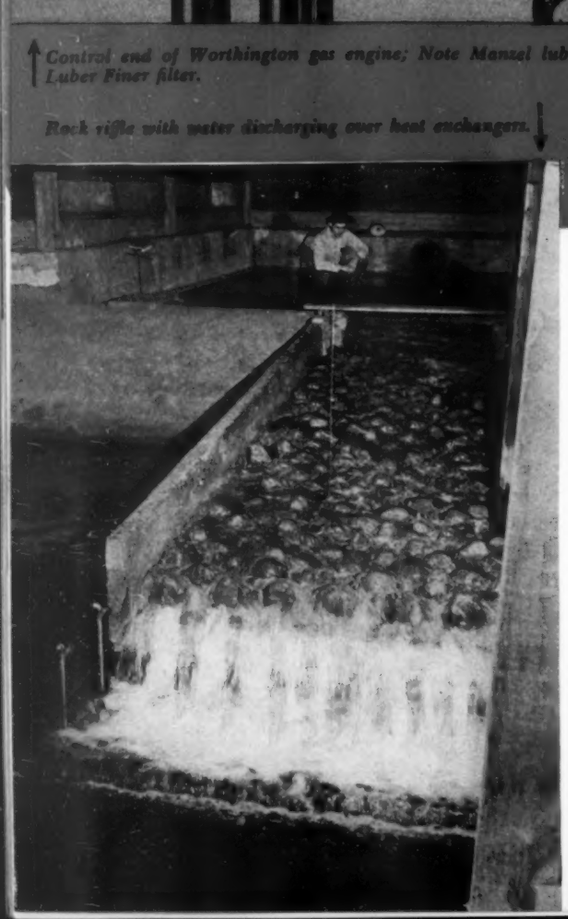






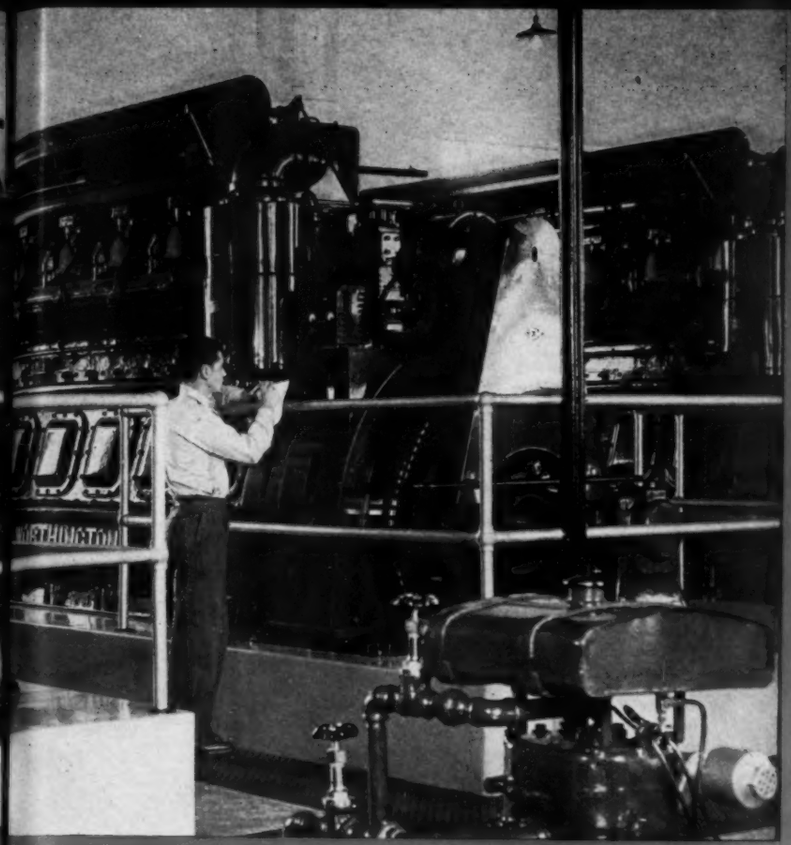
↑ *Control end of Worthington gas engine; Note Manzel lubricator, below which is the Luber Finer filter.*

Rock riffle with water discharging over heat exchangers. ↓



compressor, separate and independent of other station power. Air is stored in two steel flasks on concrete foundations outside engine house. Dual oil filters of different types and continuous operation are connected in the engine lines with heat exchanger guaranteeing clean lube oil at proper temperature for efficient engine operation. At the end of 200 operating hours, the lube oil is transferred to the dirty tank of thermostatic controlled purifier, purified and stored in clean tank for future use as required.

The circulating water system with 160-in. closed type cooler and heat exchangers is served by three cooling water pumps with pressure gauges on suction and discharge sides. On each engine is mounted temperature control switch connected to one alarm on switchboard which operates horn and indicates on switchboard annunciator particular engine in trouble. An interesting and unique feature of this cooling system is the installation of the heat exchanger in the discharge end of the rock and concrete riffle transferring the well water from the settling basin to the collecting reservoir. Constant immersion in the cold flowing water simplifies temperature control with the least possible equipment and expense. Exhaust pyrometer with one master dial and eighteen thermocouples, one for each cylinder of the three en-



The three gas engine generating units. Note Vortox air cleaners also Pickering governor back of exciter on center unit. Aeration compressors, center; circulating pumps and feed water heater, right; switchboard, left.

gines, is mounted on pedestal at the control end of the center engine. Air intake and engine exhaust are controlled by individual cleaners and silencers.

Water for the district is obtained from eight deep wells of over 1,000 feet with 140-ft. pumping level, and three shallow wells of 175 feet with 50 ft. pumping level averaging 1,200 to 1,800 gpm. each. Motor driven turbine pumps housed in separate buildings. These pumps, two 60 hp., five 50 hp., and four 40 hp., discharge through pipe lines into the 50′ x 35′ x 8′ concrete settling basin where treatment originated by this company enters its first stage. Purification treatment consists of copper sulphide, two parts per million, passed through solution feeder into aeration chamber where it is absorbed by water passing through on the way to collecting reservoir. At that point the ratio is three parts per million dissolved oxygen; after aeration, the ratio is raised to 6.6 parts per million, also the algae is destroyed by the aeration. In addition chlorine, 25 ppm. is added. Aeration is supplied by two 10″ x 7″ motor driven compressor units. From the aeration chamber, the water passes over the long rock studded riffle that leads to the collecting reservoir and at point of entrance to suction tunnel ammonia and chloride are added, raising the residual chlorine content to one ppm. Total hardness of water is rated at 75 ppm. From the suction chamber five centrifugal booster pumps serve the high and low pressure mains of 100 pounds and 50 pounds respectively. The single 150 hp. two stage pump serves the high pressure line exclusively; the two 125 hp., and two 40 hp. double suction pumps are so arranged that as conditions demand, the operator may valve any of the four pumps into either of the two systems. This is necessary because of the extreme pumping conditions and cost variations due to the use of two systems, one serving the higher levels and the other the flat areas. Also because the water demand varies with the time of year, the peak being in the months of August and September, and the amount of natural precipitation which also varies from year to year, no two alike.

In computing power costs the unit of 1,000 gallons raised 100 feet is used. Because the gas engines have been in operation only since January 24, operating cost data is limited to the period ending June 30, a little over five months of service. But regardless of this and the unusual precipitation of the last winter months which considerably lessened the water demand, January's cost per unit was .00448, including power purchased to the 24th, compared to .00684 for steam plant; February, .00216 to .0064; March, .00153 to .00459; April, .00206 to .00562; May, .001716 to .00462; June, .00174 to .004503, a commendable record.

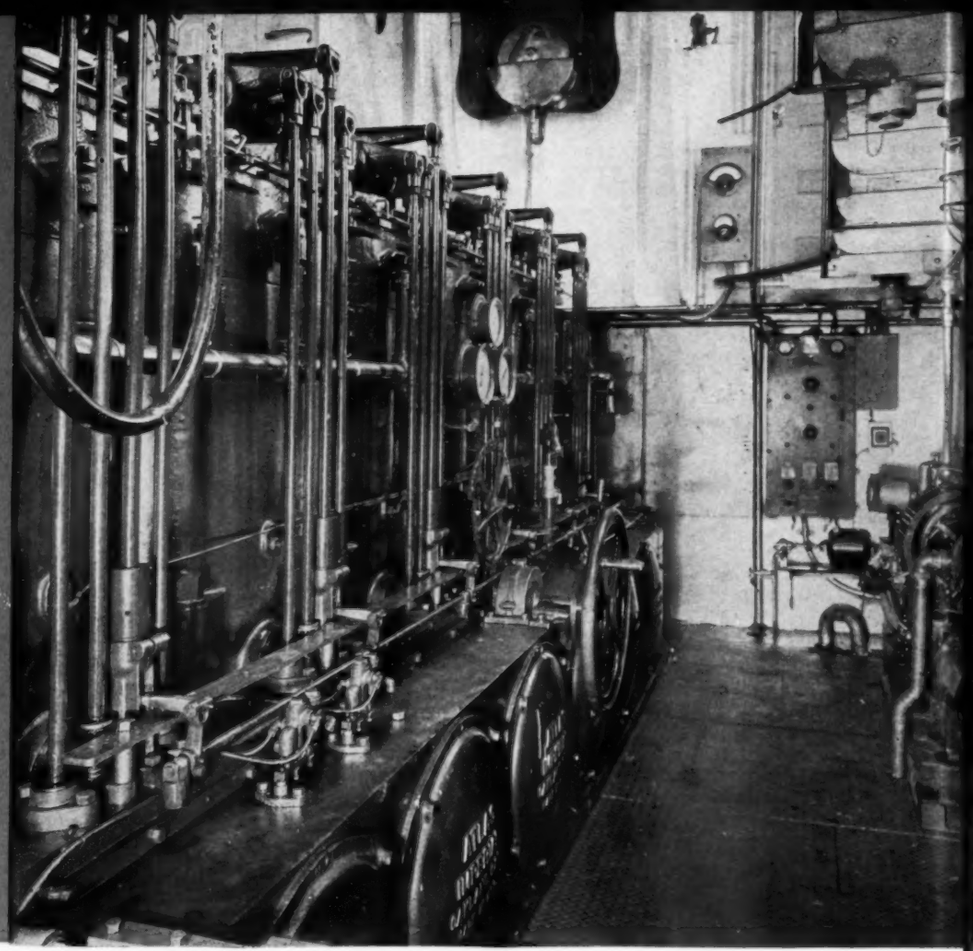
For comparison purposes the month of June may well be taken as an example of the cost economy of these gas engines: gallons pumped, 543,375,851, total cost $945.04, unit cost .00174; last year using steam power, gallons pumped, 525,774,100, total cost, $2,368.88, unit cost, .004503. Total comparative cost for six months' operation for the two years: steam, $9,994.61; gas engine, $3,580.14; saving, $6,414.47 or 64.2%. With the driest part of the season yet to come, the percentage should reach 75% for the year, proving that gas engines do pay their way.

Some outstanding features of this interesting plant will bear special mention: One central concrete and steel building houses both steam and gas plants with their auxiliaries keep operating costs to a minimum; unusual water purification by use of three chemical instead of the usual one or two; specially designed rock riffle to facilitate aeration; an original design by the superintendent; 20″ and 33″ steel water mains wound with doubled No. 10 wire and coated with 3-inch concrete to protect against the excessive electrical leakage from the numerous electric transportation lines bi-secting the district, also original with Superintendent E. P. Tallon; and last but not least, the exceptionally well kept power house, and grounds containing the homes of Superintendent Tallon, Chief Mechanical Engineer T. V. Tallon, and the older regular employees.

Equipment items of interest, in addition to the three Worthington CCG-6 gas engines, are the three Electric Machinery Co.'s 265 kw. alternators; cooling water pumps by Worthington; pumps by Worthington and Kimball-krough; motors by G. E., U. S., and Westinghouse; switchboard by Mullenbach of Los Angeles; switch gear by Electric Machinery Co.; switchboard instruments by Electric Machinery Co., Weston and General Electric; heat exchangers by Ross and Braun; exhaust silenced by Maxim; air filtered by Vortox; lube oil filters by Cuno and Luber Finer; lube oil cooler by Ross; lube oil pressure gauge and thermometer by Ashcroft and U. S. Gauge; lube oil alarm by Minneapolis-Honeywell; gauges by Marshalltown; water valves by Crane; thermo control valves by Powers; circulating water switches by Mercoid; governors by Pickering; engine and compressor lubricators by Manzel; lube oil by Standard Oil Co.

DIESEL TUG "JOHN COLLE Jr."

By WARREN GLEASON



Main Atlas Diesel, left; Stover, Diesel-driven auxiliary unit, right; Weston tachometer and Alnor pyrometer, center.

THE wide, deep Pascagoula River provides the State of Mississippi with one fine port at which it was inevitable that the construction of deep-draft, seagoing ships should become an active interest. Here, during the first World War, wooden ships were built, among them the huge barkentine *Monfalcone*, largest sailing vessel afloat. At present, in Pascagoula are located the yards of the Ingalls Shipbuilding Company, turning out ships for the Maritime Commission. Here, too, are the yards of F. B. Walker and Sons, builders for over thirty years of smacks and trawlers, tugs and barges and yachts, of both wood and steel construction.

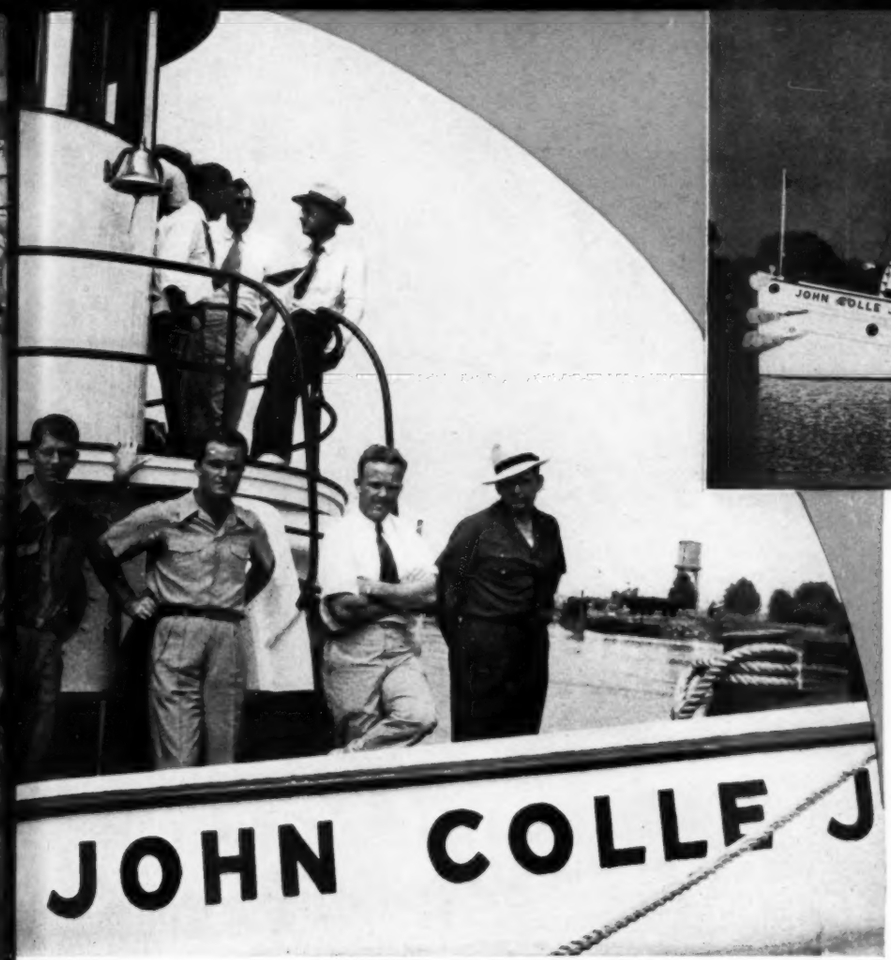
The latest launching by F. B. Walker and Sons —and incidentally the most powerful tug ever built by the firm is the *John Colle Jr.*, designed and built for another old-established Pascagoula firm, the Colle Towing Company, Inc. Due to the success which the Colle firm has had with Diesel tugs, a number of which have been built for them by the Walker yards, it was a foregone conclusion that the new tug should also be full-Diesel. And as previous tugs were powered with Atlas Imperial Diesels, the good results in the past with this engine determined the powering of *John Colle Jr.* with another Atlas. Captain Herman H. Colle, president and general manager of the towing company, has been identified with tugboating all his life and consequently has ideas about proper operation and propulsion. Too, the firm of Arthur Duvic's Sons, Atlas distributors in the Gulf area, are no newcomers but have supplied marine power plants for generations. Both Capt. Colle and the Duvic organization have learned from experience that a tug for heavy towing performs most satisfactorily when powered with a slow-turning engine fitted with a propellor of large diameter.

For the *John Colle Jr.* a 400 hp. Atlas, 6 cylinder 13″ by 16″, operating at 300 rpm. was the Diesel chosen. Hull and structure of the tug was designed by Arnold Walker, of the building firm; cabin plan and interior arrangements of the tug were outlined by Capt. Colle; all engineering details, including furnishing of the power plant, accessory machinery and many of the equipment items, were left to Arthur Duvic's Sons. According to Manuel Duvic, general manager, "We took the contract to furnish the complete tug, and we delivered it complete with every last thing aboard except fuel, lube oil, grub and towlines."

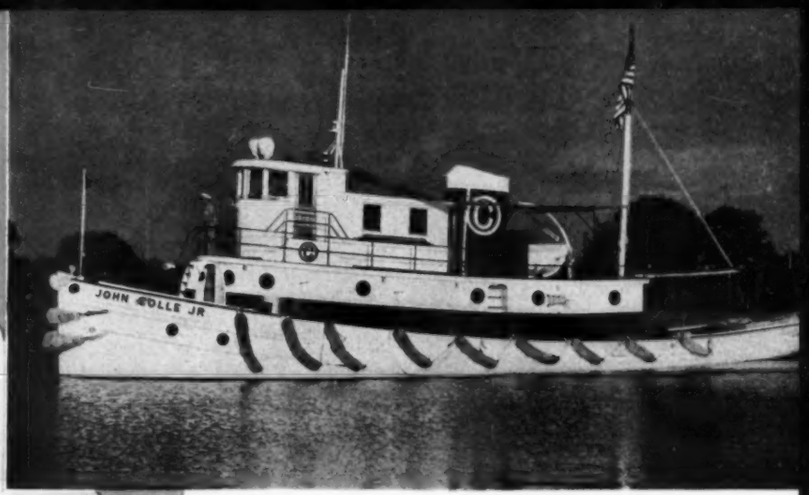
The propelling Diesel is a standard Atlas model, fitted with built-in fuel pump and filters for lube and fuel. Fuel injection is by the Atlas common-rail system. As a further guarantee of pure lube oil, a Nugent pressure lube filter is installed. Cooling is by a hull condenser designed by the Duvics. The Alnor pyrometer system is installed, and Weston tachometer, reversible type, with two gauges one in the engine room and one in the pilot-house. From the forward end of the Diesel drive shaft a 3 kw. Columbian generator, 32 v., is driven by V-belt drive.

The auxiliary unit is also full-Diesel. Here a one-cylinder Stover Diesel of 5 hp. is used, in a unit designed by the Duvics and mounted on a common base; a Quincy 2-stage air compressor, another 3 kw. Columbian generator and 2″ Viking fire and bilge pump complete the unit. The boat's electrical system is 32 v., using Exide Ironclad marine-type batteries.

The main Diesel is direct-connected through a 6″ steel propellor shaft to a 76″ by 34″ Columbian Bronze propellor, the shaft being bronze-bushed at both the stuffing-box and stern bearing positions. The outer end of the stern tube



On the deck, left to right, Carl Geiger of Arthur Duvic's Sons; John F. Walker and Arnold V. Walker of F. B. Walker & Sons; and John H. Colle of the owners.



The "John Colle Jr." trimmed for service.

is fitted with a flange-type Goodrich Cutless bearing, water lubrication being supplied by a double-acting plunger pump direct driven by a flat belt drive from the propellor shaft.

Throughout the engineering of the mechanical installations there is ample evidence of experience and knowledge of possible sources of tugboat grief. In the auxiliary unit, for instance, the compressor, the pump and the generator are individually connected to the Stover Diesel by Dodge clutches; any one of the machines may be operated separately. A pump breakdown will not interfere with use of the compressor and so on. The hull condenser made for strength of double extra-heavy wrought-iron pipe with outside water at 84 degrees will reduce engine temperature down to 118 degrees; the water pump built-in with the Atlas handles the circulation, and direct cooling from flotation water could be employed if necessary; in the lubrication of the Cutless bearing, the double acting water pump ensures proper flow of water to the bearing whether the boat is going ahead or in reverse. The structural mounting of the auxiliary unit is so well braced and built into the hull that when the Stover is being operated, with the main engine shut down, there is no vibration noticeable from the Diesel auxiliary unit.

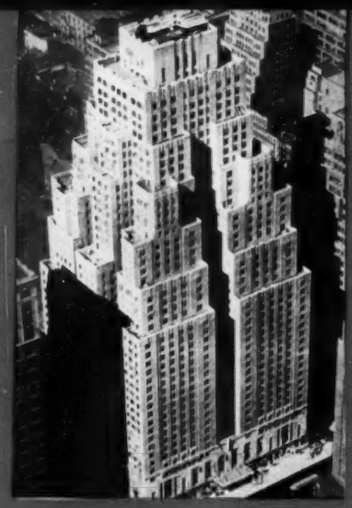
Fuel storage is arranged for 10,000 gallons in three tanks, one aft, one just forward of amidships, and one in the forepeak. Tanks are manifolded and valved so that from the engine room controls fuel may be moved from one tank to another or direct to the engine through an Oberdorfer electric-driven gear pump. The same Diesel fuel is likewise used in the galley range, a 2½′ WebbperfectioN which in addition to cooking also provides hot water to the galley, lavatories and shower. A Frick compressor in the engine room handles the Midwest refrigerator in the galley.

Steering of the tug is done by the Bollinger compressed-air system, with wheels both in the pilot house and on the after end of the upper deck. The pilot house also houses a Seth Thomas clock, Ritchie navy-type compass, Taylor "Stormguide" barometer, engine room controls and controls for the Kahlenberg Triplex air horn and the two 12″ Carlisle Finch searchlights. The pilot house and captain's cabin structure on the upper deck are of wood, for comfortable hot-weather climates; panelling in the pilot house is of mahogany. From the upper deck down the hull is entirely of steel, arc-welded with no rivets being employed.

In operation, there appears to be perfect balance between the large-diameter wheel, the slow-speed engine and the well-constructed hull. Vibration is marked by its absence, even at full speed ahead; the wake of the tug is almost flat. Dimensions of the tug are 75′ overall, 19′ beam and 8′ draft; she rides the waves well in rough going and is an easy, smooth performer.

Principal use of the tug will be in the Intracoastal Canal, between New Orleans and Houston, Texas. The Colle Towing Company, Inc., with offices both in Pascagoula and in New Orleans, owns a number of other tugs and a fleet of barges, engaging in contract delivery of crude petroleum and similar products as well as in other tugboat operations. The day following the trial runs, the *John Colle Jr.* was put into active service, a compliment to the Walker yards and to the Arthur Duvic's Sons engineering department.

Other features of the new tug include Maxim exhaust silencers, one each for the main engine and the auxiliary, both mounted in the stack; Deming pressure water system to galley and lavatories; Butane gas radiators in cabins and pilot house; Torrey 16″ extra heavy bronze portlights; Lane lifeboat; lighting fixtures of vapor-proof bronze designed and cast by Duvic; all piping and fittings aboard are of copper, with sweat-fitted joints; Milwaukee water-valves; American La France foam type and tetrachloride fire extinguishers; main Diesel equipped with Kingsbury thrust as particularly adapted to towing work. Texaco "Ursa" oil used for engine lubrication.



Hotel New Yorker, New York.

HOTEL ASSOCIATION RECOMMENDS DIESELS

THE American Hotel Association, in volume two of its "Hotel Engineering," has this to say about the use of Diesel Engines in hotels—"Although Diesel engines have been frequently suggested for use in hotel power plants, there are comparatively few installed in hotels. This situation seems to prove that the qualities of the Diesel engine are not fully appreciated. The Diesel engine is the most efficient machine available today for converting heat of combustion into mechanical power. It is comparatively simple in design, rugged in construction and efficient in operating performance. Great strides have been made in the development of the Diesel engine during the past eight years, and today thousands of these engines are being used for operating heavy machinery such as tractors, trucks, factory machinery, as well as for the generation of electric current.

"There are many hotels throughout the United States, particularly small and medium sized hotels, paying comparatively high electric current rates that would benefit substantially through the installation of their own Diesel electric generating plants.

"For instance, the average Diesel engine electric generator will produce 10 kwh. of electric current with one gallon of fuel engine oil which can be obtained in practically every part of the United States at an average cost of 7c per gallon. This same Diesel will also consume only about one gallon of lubricating oil costing 50c per gallon for every 1,000 kwh. generated or ½ of one mill ($.0005) per kwh., with an extra cost of one mill ($.001) for maintenance. Consequently, a typical Diesel engine cost for producing a kwh. of electric current, exclusive of interest and depreciation, amounts to about $.0085, which is considerably below what many hotels are now paying for their electric current. Hotels that now pay an average of more than $.0175 per kwh. for electric current should seriously consider a Diesel electric generating plant. What is known as 'packaged units' are available. They are highly dependable in performance, comparatively easy to operate and maintain and reasonably inexpensive to install. A typical Diesel generating plant installation for a small or medium sized hotel will cost anywhere from $90.00 to $130.00 per kw. of capacity, depending upon the extent of the requirements. It is not unusual for such a plant to amortize its complete installation cost out of the savings in from three to five years. In addition to producing electric current at very low cost, i.e., fuel oil, lubricating oil and maintenance, the Diesel engine gives off a great deal of heat to the cylinder jacket cooling water which can be used for hot water supply purposes by the hotel.

"Approximately 20 to 30 gallons of this heated water per horsepower per hour or between 50 and 55 Btu.'s of heat per minute per horsepower of load, will be made available.

"This heated water leaves the Diesel engine at temperatures varying from 140° to 180° F. which is the hot water temperature range required by most hotels.

"The Diesel engine also gives off an exhaust which varies in temperature from 750° to 950° F., which heat can largely be utilized by means of economizers for the generation of steam suitable for heating the building, hot water and other hotel steam processing requirements.

"All of these factors, including low cost of operation with valuable heat by-products that can be utilized, make the Diesel engine an asset to the hotel when properly installed. Diesel engine installations require from two to three square feet of floor area per kw. of capacity and can readily exhaust their gases into the chimney stacks found in most hotels. Modern Diesel engine installations should not create objectionable vibration or noise if the machinery is properly isolated and insulated with suitable provision for muffling the exhaust. There are a number of reputable Diesel engine manufacturers of both high speed and low speed engines. The low speed engines are usually less noisy and more expensive to buy. They range in speed from 300 to 600 rpm., while the high speed engines run from 700 to 1200 rpm., which speed is usually found in the smaller units carrying the lighter electric loads suitable for small hotels.

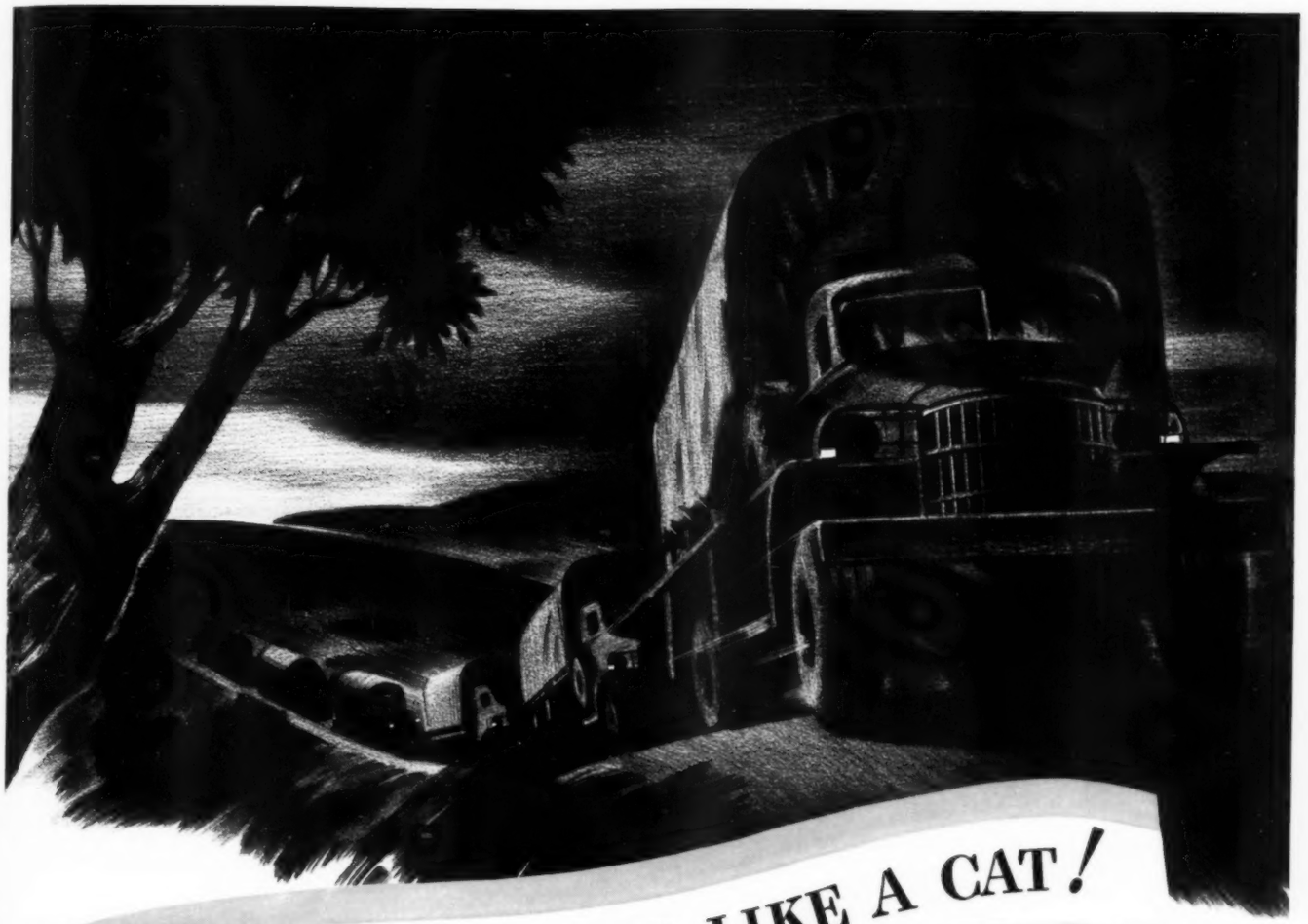
"The large, low speed engines use a heavy No. 3 fuel oil, while the small high speed engines use a lighter No. 2 furnace oil such as that consumed by Diesel tractors and trucks throughout the United States.

"Several Diesel engine manufacturers have well established engineering divisions that are capable of handling complete plant installations including assistance with financing if necessary. Experience shows that it is a good policy to employ a competent outside engineering consultant where serious consideration is being given to a Diesel plant installation. This consultant will make a thorough analysis of the hotel's electric load conditions and its present electric cost, and will give careful study to such factors as location of plant, cooling water and exhaust stock facilities, problems of noise and vibration, operating and maintenance personnel, as well as many other important factors that should be analyzed from the hotel owner's and operator's point of view before an installation is to be made.

"It is comparatively easy for Diesel equipment companies to present hotel owners with theoretically attractive generating plant propositions, but it is sometimes quite another matter to carry some of these propositions through to a successful completion. In the final analysis the hotel owner must rely upon his own judgment and the opinions expressed by his outside consultant in determining the merits of both generated and purchased electric current. Under any condition, this subject should be studied by every owner and operator of a hotel.

"Although it may not be feasible for a hotel to install a Diesel electric generating plant, it may be very desirable to consider a Diesel engine drive for some large piece of equipment, such as a central refrigeration compressor machine or air conditioning unit. A direct engine drive of this type is usually far more efficient than an electric motor drive using generated current.

"In some sections of the country, where gas is plentiful at low cost such as in Southern California, Texas and Oklahoma, it would be well to give serious consideration to the use of gas driven Diesel engines specially designed for this purpose. For general purposes of comparing generating costs with the two fuels, gas at 20c per thousand cubic feet compares with fuel oil at 4c per gallon, while gas at 25c compares with oil at 5c and at 30c, with oil at 6c . . ."



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FUEL OILS AND LUBRICANTS

By R. L. GREGORY*

FUEL Oils and Lubricants have long been favorite subjects for discussion and argument among Diesel engineers. Sometime ago, the writer heard one of these unrehearsed discussions between two old experienced Diesel men upon the relative merits of a certain grade of fuel oil and certain lubricants. The argument was the more interesting, because each engineer had used the products in question and had arrived at opposite conclusions as to their results. The first engineer stated that in his years of operation of his plant he had used several types of fuel and lubricants, and that he had obtained the most satisfactory results from the products in question. The second engineer stated that he, too, had used various grades of fuel and lubricants, those in question included, and of all the products he had tried, he had experienced more grief with those in question than any of the others.

The argument ended with each engineer still firm in his conviction that his conclusion was right, and from their long years of experience both were capable of passing judgment on the relative merits of the products in question. But they had been discussing the physical characteristics and generalities of the products in question, and had not taken into consideration the fact that the products in these two instances had been applied to two different plants, the units of which were as different in design, mechanical, and physical characteristics as day is from night. Consequently, the reaction and behavior of their respective units in operation would also be at variance, and the results obtained from the products in question would very likely be at variance also.

In making this statement, I do not mean to infer that it would be impossible to get satisfactory results from the same fuel and lubricants in engines of different design and characteristics, but it would be highly improbable. Had the engineer, who had difficulty with this grade of fuel and brand of lubricants which caused excessive carbonization, had the time to investigate further into the behavior of his units while operating with these products, he might have found other causes which contributed to his trouble, since most vendors of oils and fuels of high repute manufacture products which, under the proper conditions, give satisfactory results. The characteristics of the engines you are operating, however, must be taken into consideration when buying fuel and lubricants, since it is easier to obtain these products suitable to your engine's requirements, than it is to adjust the mechanism of the units to the products in question.

We are all more or less familiar with the underlying principle of a Diesel Engine, as well as all internal combustion engines: That of conversion of fuel or chemical energy by a continued recurring explosion into heat, the heat into reciprocating motion and thence by mechanical means the reciprocating motion into rotating motion. The sequence with which these various steps occur and their relation to each other, form the basis for variations of Diesel design. The methods of fuel injection, of excess heat dissipation, and the methods of expulsion of excess gases vary in different designs of engines. Consequently, with these various designs, some fuels and lubricating oils will give better results in one type of an engine than in another.

Certain terms are used in the classification of lubricant and fuel oils, with all of which each engineer should familiarize himself. Such terms as gravity, viscosity, pour test, fire point, flash point, carbon residue, sulphur, acidity or neutralization number, saponification number, demulsibility and emulsification should be known.

Gravity refers to the unit weight of petroleum products. It is of little value in indicating lubricating qualities of oil or the fuel value of any fuel. But when indicated by Baume scales, does identify the base of the crude from which the product is derived, as being either naphthene or paraffin base, paraffin base oils being of lighter gravity.

Viscosity of an oil is of vital import in selection of your lubricants and fuel, since it indicates the ability of an oil to flow. All engine manufacturers recommend certain viscosity oils for their units. The heavier the oil, the higher the viscosity. Diesel engineers should insist on lubricants and fuels of the proper viscosity. In the case of too light a viscosity oil, you may obtain scoring, since the oil is not heavy enough to eliminate metal to metal contact.

On the other hand, too heavy an oil may mean added friction and loss of power. In determining viscosity, the Saybolt Viscosimeter is universally adopted. The viscosity of an oil is the number of seconds required for 60 cubic centimeters of oil to flow through a Viscosimeter at 100 degrees F. Follow your manufacturer's recommendations on the viscosity of your oil. He has tried them and is best suited to advise you on this matter.

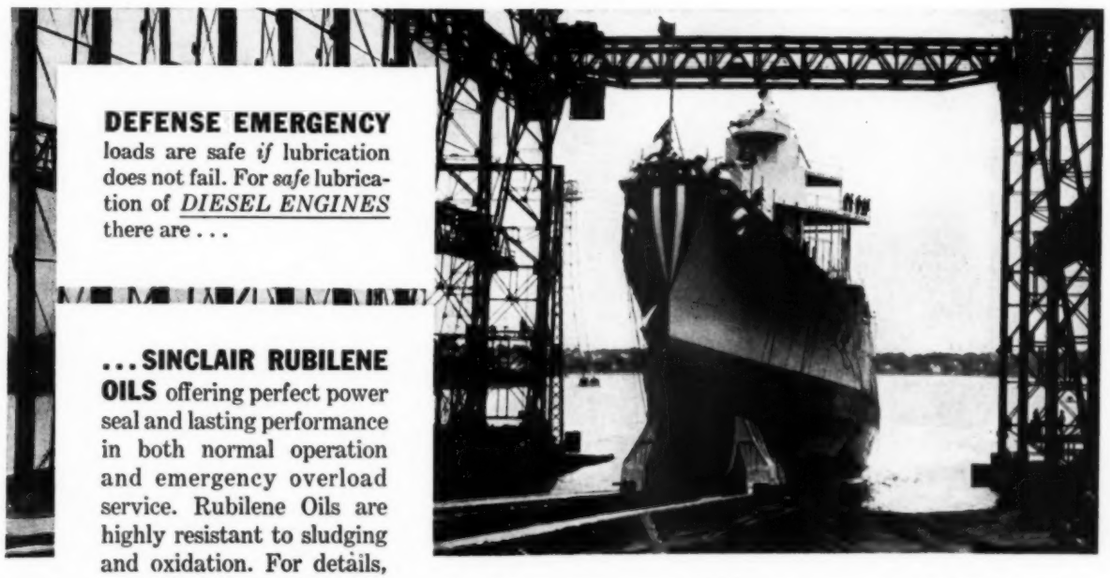
Pour Test refers to the least temperature at which oil will pour. This is of importance to those engineers who operate engines in extreme cold weather conditions, and under conditions where difficulty is experienced in heating fuel or keeping lubricants from congealing. Congealment of fuels and lubricants can and have caused many shutdowns and difficulties.

Fire Point and Flash point go together. Flash point refers to that temperature at which inflammable vapors will be given off to such an extent that they will ignite when exposed to a naked flame. This is of importance since the flash point should be high enough so that the oil will maintain a good lubricating film without vaporizing excessively. Diesel lubricants generally range from 350 to 450 deg. F. depending upon viscosity and base. The fire point is found by increasing the temperature of the oil beyond the flash point until the vapors given off keep burning, rather than just flash.

Carbon residue refers to the carbon deposited on the pistons, rings and liners. Oils vary greatly in the amount of carbon residue which they contain. Many of the oil vendors have now produced oils which eliminate the most of this carbon by cleaning as they lubricate. This should be taken into consideration when buying your oil. Excessive carbon residue, however, more often comes from improper amount of

. . . . . *Please turn to page 56*

* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*



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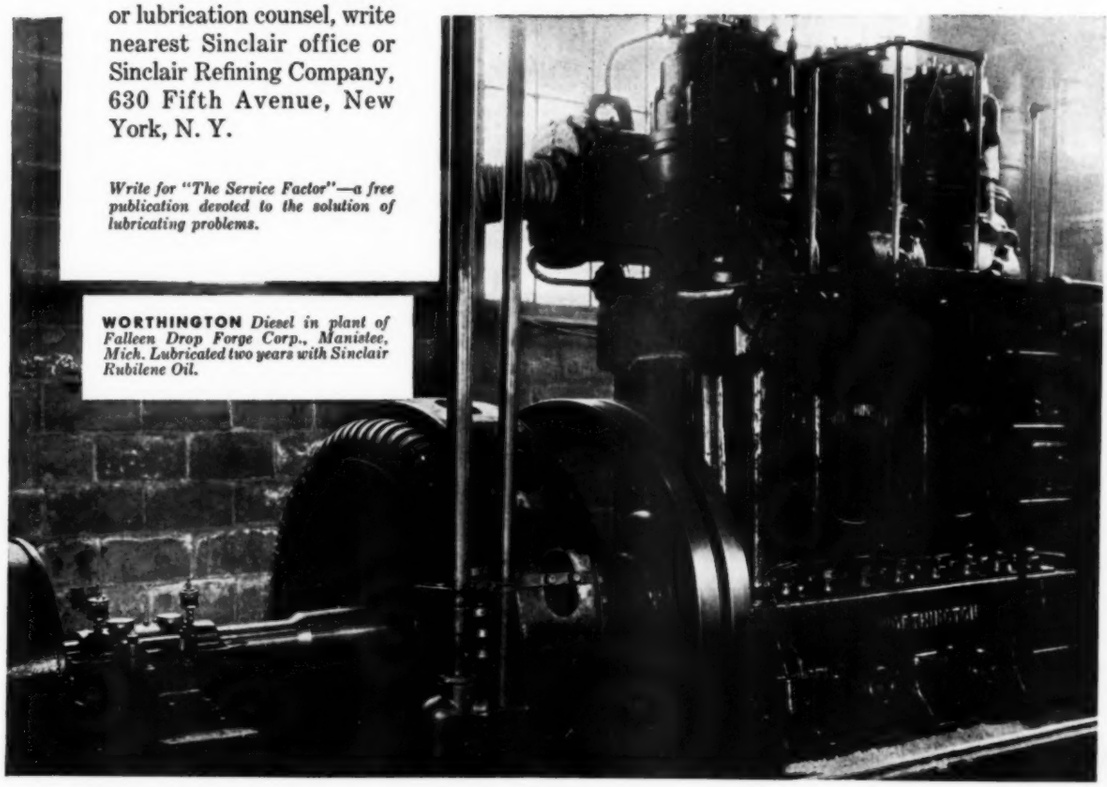
Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



WORTHINGTON *Diesel in plant of Falleen Drop Forge Corp., Manistee, Mich. Lubricated two years with Sinclair Rubilene Oil.*

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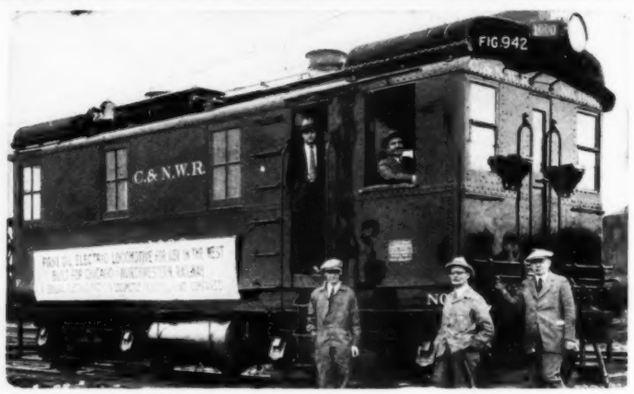

The smaller illustration directly above is a view of the first Diesel-Electric locomotive for use in the West, built in 1926 for the Chicago & Northwestern Railroad by General Electric and Ingersoll-Rand Companies. The engine bearings were protected from wear and damage by a Nugent lubricating oil filter!

The larger illustration is a view of the new "Super Chief," Santa Fe's Diesel-Electric giant, built by American Locomotive and General Electric Companies. This train covers the 2,227 miles between Chicago and Los Angeles in 39¾ hours. Here, as on *all* Santa Fe passenger Diesels, Nugent Filters are used to provide continually clean fuel oil for the four 1,000 hp. Alco Diesels. In addition, five of the Santa Fe streamlined locomotives are also equipped with Nugent lubricating oil filters, to protect them against "dirt troubles." Write for complete information.

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LACEY MORRISON DIES

LACEY H. Morrison, Editor of DIESEL POWER, died suddenly of heart attack on the evening of September 21 at his home at [illegible] Highland Avenue, Port Washington, Long Island, N. Y. Mr. Morrison leaves a widow, the former Emma Snow, and a daughter, Mrs. Laura Gottlieb of Port Washington.

The whole Diesel Industry grieves with Mrs. Morrison. Lacey had many, many friends in this industry, from one end of the country to the other. He has been a strong proponent of the Diesel from away back and we are going to miss him—all of us.

SUPERVISING AND OPERATING ENGINEERS' SECTION

. . . . *Continued from page 54* . . . .

lubrication or excessive fuel, than it does from any other source. Even the best of fuels and oils will carbonize if not properly used.

Sulphur is a corrosive substance, very objectionable and injurious to your unit. When it comes in contact with moisture or air, it forms sulfuric or sulfurous acids. While it is allowable to have more sulphur in fuels than in lubricants, both are objectionable and should be kept at a minimum.

Acidity is probably one of the most vital points to consider in your oils. The acidity of an oil depends upon its base and will be found in both mineral and fatty oils as well. In mineral oils, however, the acidity is usually negligible. But it will increase when oxidation conditions occur and when the oil is subjected to moisture, air or heat. With this increase in acidity, there is usually an increase in sludge formations, this being especially true in crankcase oils. The neutralization number is merely a measurement of this acidity.

Saponification might be referred to as soap, it being a combination of an alkali and fatty substance. This is a chemical reaction. This should be kept as low as possible.

Emulsification refers to the condition wherein oil will mix with water or moisture. Demulsibility is just the opposite, being the tendency of oil to separate from water. Emulsification is not injurious when lubricating oils are used in the presence of moisture, If sludge can be disregarded, but if sludge must be guarded against as in crankcase and oil lines, the emulsification must be kept low to prevent clogging.

In such cases where oil must be forced through small piping, demulsibility is most desirable.

Engineers should frequently check their oils and fuels. All vendors will gladly give you periodic analysis on both your fuel and lubricating oils and thus you will not only have a record on your products, but can correct any faults before they cause trouble.

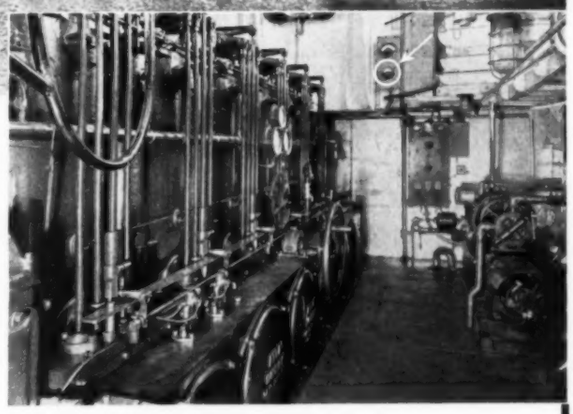
IN the Maritime Commission's 500-ship program, two more new merchant ships have been delivered. The *American Press* built by the Western Pipe and Steel Co., Inc., San Francisco, Calif., was delivered to the United States Lines in New York City. This is a C-1 cargo vessel of 8,975 deadweight tons (6,779 gross tons), has Diesel propulsion, and an overall length of 417 ft. 9 in. with a designed sea speed of 14 knots. It is the fourth of five ships built at the same yard for this operator.

The motorship *Idaho*, built by Seattle-Tacoma Shipbuilding Corp., was delivered to the Pacific-Atlantic Steamship Co., Portland, Oregon, and is the first of two C-1 ships being built for this company by this yard.

These two vessels make a total of 106 in the long-range program to date.

GORDON LEFEBVRE JOINS COOPER-BESSEMER AS VICE-PRESIDENT AND GENERAL MANAGER

THE Cooper-Bessemer Corporation has announced that at a meeting of its board of directors on August 25, Mr. Gordon LeFebvre, former American Locomotive Company executive, was elected its vice-president and general manager. In joining with one of this country's oldest and largest heavy machinery builders, Mr. LeFebvre fills a management vacancy created in May of this year by the untimely



Built by F. B. Walker and Sons at Pascagoula, Miss., for Colle Towing Company, Inc., this modern 75′ tug is powered with a 6 cylinder, 13″ x 16″ Atlas Diesel, rated 400 hp. at 300 rpm. This heavy duty engine is protected by Alnor exhaust thermocouples and a bulkhead-mounted Alnor pyrometer.

Alnor Exhaust Pyrometer On "John Colle Jr."

The "John Colle Jr." went into service immediately following recent successful trials and will ply the Intracoastal Canal between New Orleans and Houston on contract delivery of crude oil and petroleum products. Continuous service will be her lot and Alnor will constantly protect her vital power. Ruggedly built, accurate Alnor pyrometers offer positive insurance against inefficient engine performance—instruments of essential importance in every Diesel installation.

●

Insist on the best protection for your Diesel engine.

Specify or buy "Alnor"
Ask for Catalog

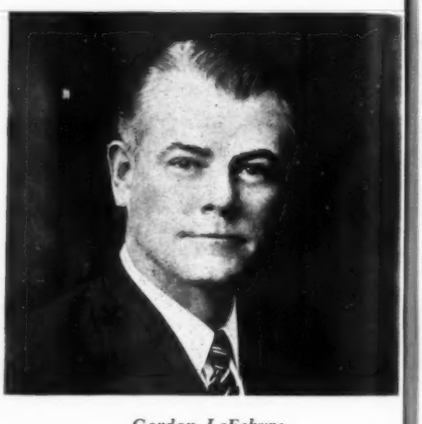
Illinois Testing Laboratories Inc.
Don't Guess Know!
423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS
Manufacturers of "Alnor" and Price Instruments—Products of 41 Years' Experience

death of Charles B. Jahnke. B. B. Williams, who was recalled at that time to again take up active duties as head of the corporation, will retain the positions of president and chairman of the board of directors. At the same meeting, Mr. LeFebvre and L. F. Williams, were elected directors of the corporation.

Mr. LeFebvre attended private grade and high schools in Richmond, Virginia. He is a graduate of Virginia Polytechnic Institute and attended the United States Military Academy at West Point, N. Y. From 1913 to 1914 he served as a special apprentice and machinist for the Northwestern Railway. During the years 1915 to 1919 he was affiliated with E. I. Dupont de Nemours & Company as machinist, master mechanic, and finally, mechanical superintendent.

In 1919, Mr. LeFebvre became associated with General Motors Corporation at its Chevrolet Division. He was in charge of construction of the Chevrolet plant and, later, responsible for production there, under Wm. S. Knudsen. He was then elevated to the position of vice-president in charge of all General Motors Corporation activities in the Dominion of Canada, following which service he returned to the United States to assume the duties of vice-president in charge of operations at the company's Pontiac Division.

From 1932 to 1936, Mr. LeFebvre was a consulting engineer with offices in Detroit, Michigan, and eventually became associated with A. J. Brandt, Inc. In 1937, he joined the American Locomotive Company as manager of its Diesel Engine Division at Auburn, New York, and served in that capacity until his recent decision to accept this new position with The Cooper-Bessemer Corporation.



Gordon LeFebvre

Mr. LeFebvre brings to Cooper-Bessemer an extremely valuable experience in engine building. He is a member of the Society of Naval Architects and Marine Engineers. His broad knowledge of plant management and production is expected to serve him well in his new connection, especially in view of the corporation's greatly increased activities at both its Mount Vernon, Ohio, and Grove City, Pennsylvania, plants. He assumed his new duties September 15 with headquarters at Mt. Vernon.

★ ★ ★

ST. Louis Shipbuilding & Dry Dock Co. has received an order from the Central Barge Co., Chicago, Illinois, for the construction of fifteen coal barges and one twin screw Diesel tugboat.

★ ★ ★

THE Sturgeon Bay Shipbuilding & Dry Dock Company has received an order from the U. S. Engineer Office, in Philadelphia, for the construction of a 64 ft. all welded Diesel-equipped steel tugboat.

INSURE BETTER ENGINE PERFORMANCE

REDUCE MAINTENANCE COSTS

No. 17800 MICHIANA Filter is made for large engines. It has four elements which may be either the "Throw-away" type or the Re-Packable type.

One of the elements used in a group of four in the No. 17800 Filter and singly in the No. 17050 Filter.

No. 17050 Filter in which one element is used.

No. 17400 MICHIANA Oil Filter, furnished also with Replaceable or Re-Packable type elements.

"Re-Packable" and "Replaceable" Element Filters

MICHIANA Filters are of the depth type using "Wastex," a selected cotton waste filtering medium. Standard filters are made in a wide range of capacities and either of two types of filter elements are furnished—(1) the Replaceable or "Throw-away" type, and (2) the Re-Packable Element type in which the "Wastex" material is re-packed when servicing.

In the selection of filters, the size of engine, type of lubrication system, operating conditions, and other factors must be considered for most satisfactory results, — and MICHIANA engineers are ready to recommend the type and size filter to best meet your needs. Our Bulletin 41-D will be mailed on request.

MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana

MICHIANA OIL FILTERS

For Diesel Engines

"PACKAGED" POWER

MANY of the United States Offshore Bases would be in sad need of electric power were it not for the 50 kw. Caterpillar Diesel "Packaged" Electric Generator Units. With hardly an exception, these units in one size or another have been supplied to the many offshore bases by the H. O. Penn Machinery Company of New York. Among the well known contractors to whom Caterpillar equipment has been shipped are the Walsh-Driscoll Companies, Newfoundland Base Contractors, Panama Constructors, Inc., McWilliams Dredging Co., Nick F. Helmer, Inc., Elmhurst Contracting Co., Standard Dredging Corp., and others.

These units offer unusual compactness and real portability essential for these out of the way parts of the world. They even include specially mounted safety alarm, safety switch, and a synchronizing light for paralleling with other units. Provide fuel and give them work to do, and they are "set to go."

WEST COAST MARINE NEWS

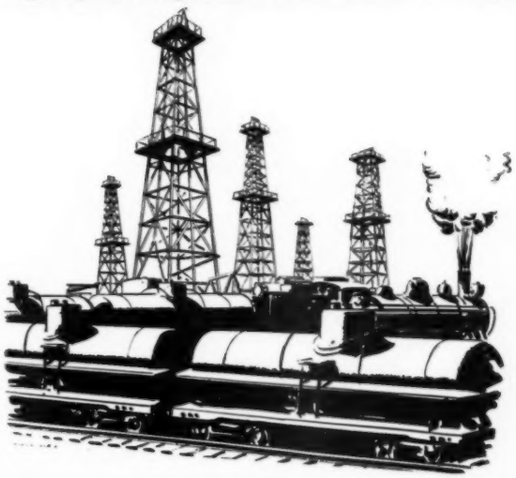
LEWIS L. Livesley, Pacific Coast manager, Superior Engine Division, National Supply Co., is now located in the new general office building at Torrance, California, discontinuing the Los Angeles office and consolidating division offices with others at the company's West Coast headquarters.

DIESEL engine sales announced by the Superior Engine Division of the National Supply Co., include a 6 cylinder, 240 hp. at 720 rpm. to Ed. Jenner, president of the Washington Tug and Barge Co., Seattle, Washington, for installation in the tug *Bee*, and a 100 hp. at 1,600 rpm. with Joe's gears to Al Pearce, for installation in his sportfishing boat, *Audal II*, San Diego.

SIX new small ferries for use between Vallejo, and Mare Island Navy Yard, California, are under construction at Nunes Bros., Sausalito, California, and they are to be powered with Fairbanks-Morse 80 hp. Diesels. Four will be equipped with Twin Disc gears and two with Joe's gears.

THE new 50-foot swordfish boat *New York*, built on Terminal Island, California, for Barney Schultz, is powered with an Atlas Imperial 60 hp. Diesel. The increase in the price of these fish has stimulated the purchase of Diesel engines for power because of the wider range it gives the fisherman.

CONSERVE FUEL and OIL



Help assure adequate Supplies for our Army and Navy

Keep Your Engines Running Efficiently —and Lower Your Maintenance Costs

Read this Diesel Engine User's Comments:

"We have recently finished a nine months' (2450 hours) run on our Buda Diesel Model D6-30 using Shaler Rislone. This is the best performance record we have obtained since this engine has been in service by three months, before having to take the engine down to remove carbon and free stuck rings.

"At the first of the year the engine was inspected and we found the rings to be free and a minimum of carbon deposit on the piston and combustion chamber. Prior to this in a much shorter time of operation we found a great many of the rings stuck and heavy carbon deposits on the piston and in the combustion chamber."

RISLONE is available in 1½ quart cans and in 5, 15, 30 and 50 gallon drums.

Gums, carbon and sludge cause rings to stick and pistons freeze. Engine efficiency is lowered and maintenance costs increase.

RISLONE, "The Oil Alloy," is a combination of little known chemicals designed to ABSORB all types of gums. RISLONE thus frees sticking valves and rings. By adding it to the regular oil right in the sump or pressure lubricators it prevents gum formations and cuts down on the "time out" for ring and valve servicing.

RISLONE reduces fuel and oil consumption by improving engine performance. RISLONE makes engines smoother and quieter running.

Write today for a copy of our 64-page book, "Engine Performance".

THE SHALER COMPANY
Waupun, Wisconsin and Toronto, Ont., Canada

SHALER

RISLONE

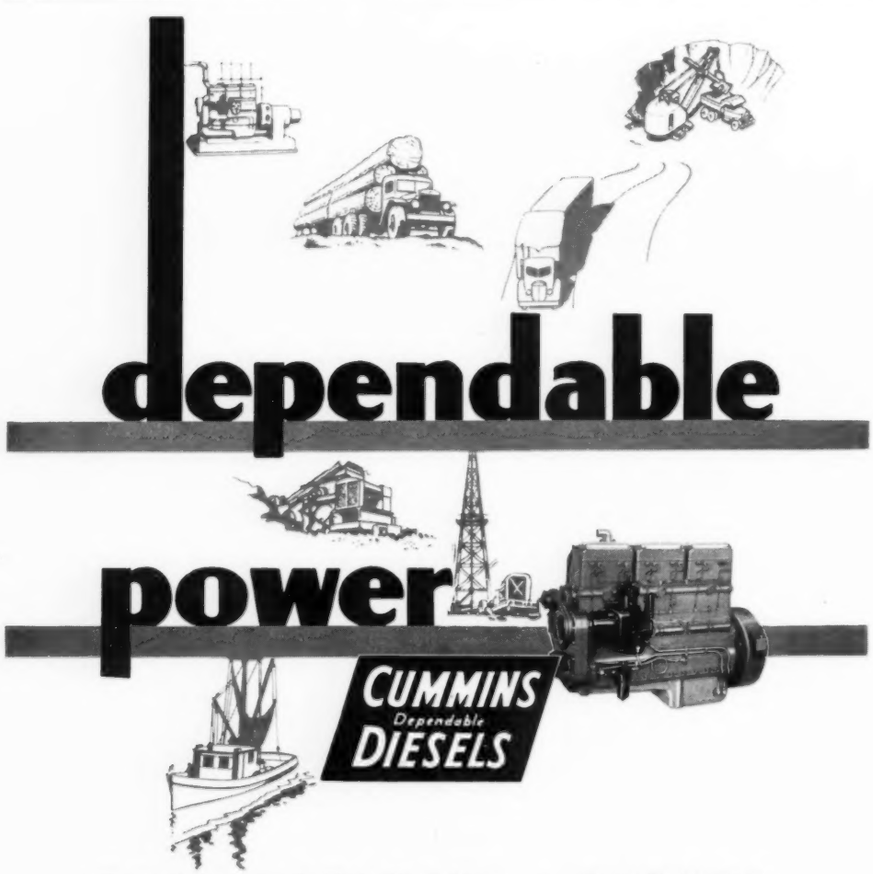
GRAY Marine Diesels have been installed in four more Puget Sound, Washington workboats. These are a 160 hp. with Twin Disc gears in Seattle H. D. P. B. No. 1; and the tugs *H. B. Jones,* Brown and Anderson, a 6 cylinder, 165 hp.; *Climax,* Colin O'Donnell, diver, a 4 cylinder, 82 hp. All are equipped with Twin Disc gears and all installations made by Evans Engine and Equipment Co., Seattle, Washington.

NORTH Wind, designed by Ed Monk, N.A., and built by the Lind Brothers of Bellingham, Washington, for Dr. E. C. Hackett of Longview, Washington, is 65 feet long and powered with two Model HMR 691 Buda Diesels with Twin Disc gears. Thermax insulated engineroom, Exide Batteries, Naud solenoid clutch controls, Photo Electric pilot are interesting items of equipment.

ATLAS Imperial Diesels have been selected to power the 70-foot tug *Columbia Ace*—a 400 hp.—built by the Fulton Shipyards, Antioch, California, for the Columbia Construction Co.; and the 48-foot cannery tender *Sea Partridge*—a 60 hp.—of the Juneau Packing Co., of Taku River, Alaska.

FAIRBANKS-Morse Diesels have been selected to power two more workboats of the Northwestern fleet: a 180 hp., 2 cycle, 6 cylinder, direct reversible for the 73-foot *Western Challenger,* Captain Chas. Clark, Vancouver, B. C.; a Model 35, for the 56-foot tug *Patty Mae,* Captain L. H. Cornell, Seattle, Wash.

THE newest addition to the Foss tugboat fleet on Puget Sound, the *Roland Foss*—Ex *Rival*—has been repowered with a new 170 hp. Waukesha Diesel that boosts the 43-foot tug's speed to 11 knots, right up with the best of them.



PAST • PRESENT • FUTURE

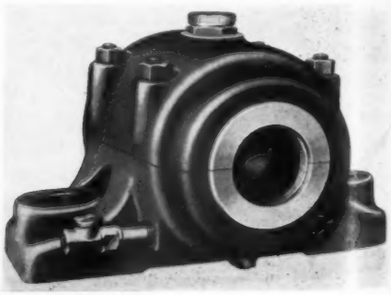
The past dependability of Cummins Dependable Diesels is a matter of record . . . a black-and-white record which covers every heavy-duty service . . . in every industry . . . in all of its applications.

The present dependability of Cummins Dependable Diesels is indicated by the fact that at least 9 out of every 10 engines produced are consigned to National Defense jobs . . . in every service . . . in every industry . . . in all of its applications.

The future dependability of Cummins Dependable Diesels is made doubly sure by the emphasis which the builders of Cummins Dependable Diesels are now placing on research and development. That's why the Cummins Dependable Diesel of tomorrow will be even more dependable for every service . . . in every industry . . . in all of its applications. Cummins Engine Company, Columbus, Indiana.

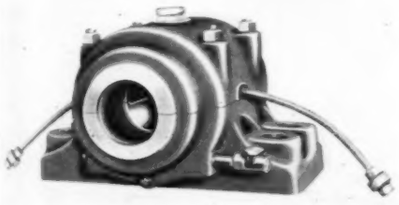
NEW DODGE PILLOW BLOCKS

THE new Sleevoil Precision Pillow Blocks in plain and water cooled types in shaft sizes from 1 7/16 inch to 8 inch inclusive were designed for a wide range of industrial applications where a high grade babbitted bearing is required. Such applications include fans and blowers, marine propeller shafts, etc.



These bearings are fully self-aligning and are furnished in either Expansion or Non-Expansion types. Expansion pillow blocks have no provision for thrust loads but the Non-Expansion bearings are supplied with two internal split thrust collars.

Sleevoil Water Cooled Pillow Blocks are identical in design and construction with the plain type except for the water cooled feature which



makes them particularly adaptable for service where elevated temperatures, heavy loads or rubbing speeds are encountered.

A bulletin illustrating and describing this new line of Sleevoil Precision Babbitted Pillow Blocks for industrial service, with engineering data, has been released by Dodge Manufacturing Corporation, Mishawaka, Indiana, from whom copies can be obtained. Ask for Bulletin A-401.

★ ★ ★

LIGHTNING, the first of five C-2 cargo vessels now building at the Sun Shipbuilding & Dry Dock Company for the United States Lines, was launched at Chester, Pa., recently.

Upon completion, this new vessel will be assigned to trans-Pacific service, serving the Far East and Australia under the American Pioneer Line house flag. This motor vessel *Lightning* was built at a cost of $2,277,000. The other four freighters of the same type are scheduled for completion during the next six months and will be named *Sea Serpent, Staghound, Shooting Star,* and *Surprise.*

A CONTRACT has been awarded by the General Purchasing Office, Panama Canal, Washington, D. C., to the Madison Marine Ways, Madison, Ind., amounting to $1,395,000 for the construction of three Diesel-electric tugboats.

★ ★ ★

GENERAL Motors Sales Corporation has awarded a contract to the Gulf Boiler & Welding Works, Port Arthur, Texas, for the construction of two Diesel-propelled boats. One of these will be 96 ft. long, 24 ft. beam, and 12 ft. deep and is to be equipped with a 1200 hp. Diesel engine. The second will be 90 ft. long, 23 ft. beam, and 10 ft. deep, with a 950 hp. Diesel engine.

★ ★ ★

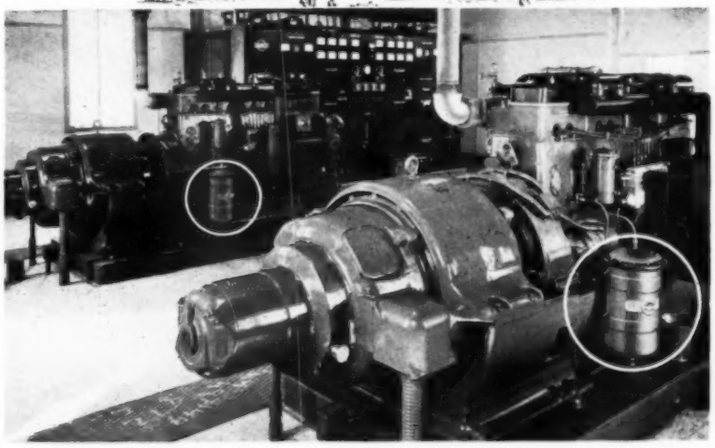
THE Maritime Commission has invited bids for the construction of seagoing tugboats which are to be Diesel propelled and 185 ft. long. The Commission will furnish the main propulsion engines, electric couplings and reduction gears without cost to the contractor for which it has already invited bids.

Contractors may bid on from one to six tugs: not more than six will be awarded for construction at a single yard or plant.

★ ★ ★

AN order was recently placed with the Jakobson Shipyard, Inc., Oyster Bay, N. Y., for an 85 gross ton Diesel-propelled tugboat which will be 80 ft. long, 21 ft. beam, and 10 ft. deep. She will be equipped with a 600 hp. Atlas Imperial Diesel engine.

HELPING MAKE HISTORY IN THE DESERT



These two Diesel generating units, at the Desert Chemical Village at Dale Lake, Southern California supply power for production of 50,000 tons of salt cake annually. Note Luber-finer equipment.

New and Unique Method of Salt Recovery with DIESELS

LUBER-FINER EQUIPPED

In addition to the factory equipped fuel oil filters, engineers at Desert Chemical Co. have installed Luber-finers to insure that lubricating oil is kept refinery-fresh over extended periods of time. That's typical of many Luber-finer installations where the "going is really tough"– where heat, sand and heavy duty make it extra hard to keep oil clean and free from excessive contaminants and acids – where drain periods need to be lengthened to assure economical engine operation.

Luber-finer adds extra life to both oil and engines because its exclusive, patented process – using ABsorbent and ADsorbent refining materials – gives greatest removal of contaminants, acid, varnish and lacquer.

There's a Luber-finer model designed to fit every industrial engine.

In addition to the Standard Refining Pack for all installations, Luber-finer offers the special DIESELPAK for use with COMPOUNDED DIESEL ENGINE OILS.

★

Write for complete data for your particular installation and name of your nearest Luber-finer Dealer.

Luber-finer

Refines Oil EVERY MILE as you drive

LUBER-FINER, INC. • LOS ANGELES

Latest Diesel Patents

A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.

Conducted by C. CALVERT HINES*

2,201,220

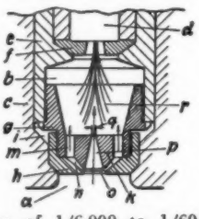
INTERNAL COMBUSTION ENGINE

Alfred Bokemuller, Gaggenau, Baden, and Franz Schaub, Berlin-Charlottenburg, Germany, assignors to Daimler-Benz Aktiengesellschaft, Stuttgart-Unterturkheim, Germany

Application February 10, 1937, Serial No. 124,976. In Germany February 13, 1936

8 Claims. (Cl. 123—33)

2. In an internal combustion engine, a cylinder including a main combustion space, a precombustion chamber, a fuel-injecting nozzle opening into said pre-combustion chamber, and a heat accumulating core member interposed between said pre-combustion chamber and said space and at least one conduit establishing communication between said main combustion space, said core being provided with a port which is substantially coaxially disposed with regard to said nozzle offering to the injected fuel a direct straight-line passage from said nozzle into said space, said port having a cross-



sectional area of 1/6,000 to 1/60,000 of the piston displacement of said cylinder whereby when the engine operates substantially above starting speeds, passage of the fluid jet through said port is prevented by the air flowing from said main combustion space to said precombustion chamber.

2,199,625

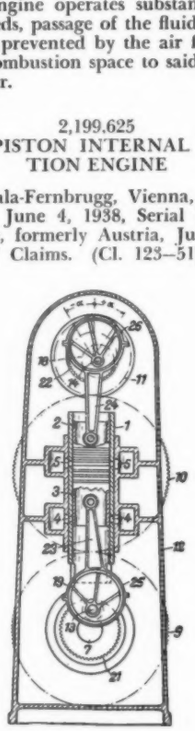
DOUBLE-PISTON INTERNAL COMBUSTION ENGINE

Benno Fiala-Fernbrugg, Vienna, Germany

Application June 4, 1938, Serial No. 211,765

In Germany, formerly Austria, June 11, 1937

7 Claims. (Cl. 123—51)



4. In an internal combustion engine, the combination of a crank shaft, a cylinder, opposing pistons in said cylinder having a combustion chamber between them, a driving means between said piston and said crank shaft comprising a cycloid drive for each of said pistons, said drives being adapted to give two stages of approach of said cylinders toward each other for each rotation of the said crank shaft.

2,194,236

FUEL-INJECTION NOZZLE, ESPECIALLY FOR LIGHT-OIL INJECTION MOTORS

Paul Schuttler and Joseph Vollmer, Berlin-Charlottenburg, Germany, assignors to Pallas Apparate G. m. b. H., Berlin, Germany

Application June 18, 1937, Serial No. 149,014

In Germany July 9, 1936

2 Claims. (Cl. 299—107.1)

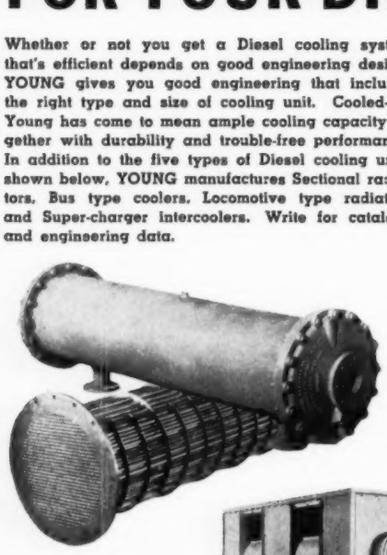
1. In combination with an internal combustion engine of the type employing light oil as liquid fuel which comprises a casing having walls defining a cylinder and a recess adapted

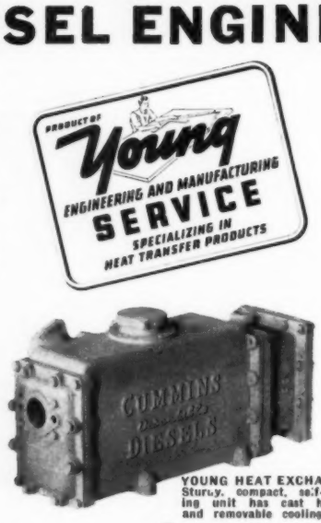
* Patent Attorney, 811 E Street, N.W., Washington, D. C.

GET EFFICIENT COOLING FOR YOUR DIESEL ENGINE

Whether or not you get a Diesel cooling system that's efficient depends on good engineering design. YOUNG gives you good engineering that includes the right type and size of cooling unit. Cooled-by-Young has come to mean ample cooling capacity together with durability and trouble-free performance. In addition to the five types of Diesel cooling units shown below, YOUNG manufactures Sectional radiators, Bus type coolers, Locomotive type radiators and Super-charger intercoolers. Write for catalogs and engineering data.

PRODUCT OF Young ENGINEERING AND MANUFACTURING SERVICE SPECIALIZING IN HEAT TRANSFER PRODUCTS

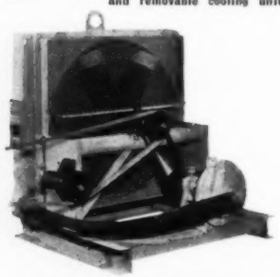




YOUNG HEAT EXCHANGER
Sturdy, compact, self-cleaning unit has cast housing and removable cooling unit.

YOUNG TUBULAR HEAT EXCHANGER
Specially designed—incorporates superior YOUNG features of construction.

YOUNG EVAPORATIVE COOLERS
For cooling engine or compressor jacket water, compressed gases or condensing vapors.



YOUNG ENGINE JACKET COOLERS
Designed for maximum cooling capacity with minimum power consumption. Eighteen different sizes.

YOUNG HEAVY DUTY RADIATORS
Rugged, streamlined — with one-piece cast iron shell and completely die stamped cooling unit.

YOUNG RADIATOR CO.
Dept. 231K
Racine, Wisconsin

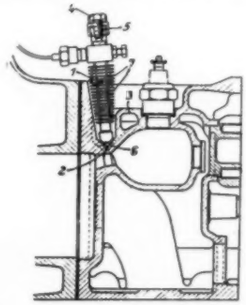
Young High Efficiency HEAT TRANSFER PRODUCTS

UNIT HEATERS • CONVECTORS • CONDENSERS • EVAPORATORS • AIR CONDITIONING UNITS • HEATING COILS • COOLING COILS

Young Quality

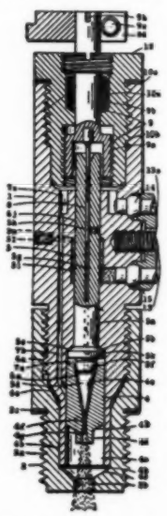
OIL COOLERS • GAS, GASOLINE, DIESEL ENGINE COOLING RADIATORS • INTERCOOLERS • HEAT EXCHANGERS ENGINE JACKET • WATER COOLERS

to receive a fuel injection nozzle, the wall at the base of the recess having a nozzle seat at its exterior surface and a fuel passage extending through said wall from the nozzle seat to the interior of the cylinder, a fuel injection nozzle spaced from and communicating with said cylinder through said fuel passage, said nozzle having its body portion concentrically spaced from the walls of said recess and in contact with said engine casing at only two



surfaces, namely, at the orifice tip which engages said nozzle seat through a restricted area and at a clamping point at the outer end of the nozzle, and a clamping means engaging said clamping point of the nozzle for maintaining the nozzle in position, whereby the conduction of heat from the engine casing to said nozzle is restricted to a minimum.

2,203,669
INTERNAL COMBUSTION ENGINE CHARGE-FORMING DEVICE
Frank David Butler, United States Navy
Application May 16, 1938, Serial No. 208,217
2 Claims. (Cl. 299—107.2)
(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)



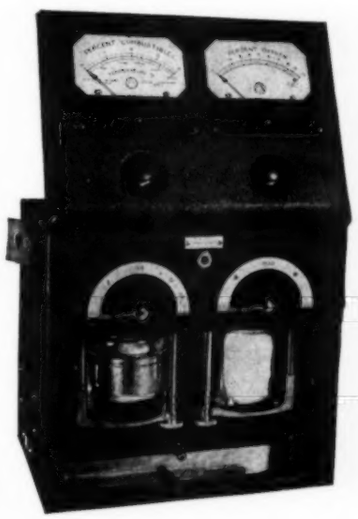
1. A fuel injection device for an oil engine comprising an elongated cylindrically shaped actuating piston member adapted to be floatably mounted adjacent the combustion chamber of such engine, a tapering seat located within said actuating piston member and terminating towards said combustion chamber in a minute cylindrical orifice, a tapering nozzle adjacent the combustion chamber end of said minute orifice, an elongated cylindrically shaped piston valve member of smaller diameter than and floatably mounted adjacent to said actuating piston member, a tapering disc integral with said piston valve member and corresponding to and fitting within said tapering seat, an elastic substance compression space adjacent the larger end of said tapering seat and disc, an annular shaped groove located in the periphery of the intermediate length of said tapering disc, a cylindrical fuel chamber located concentrically within said piston valve member and in constant communication with said annular shaped groove, a fuel supply port extending radially through said piston valve member into said fuel chamber, a fuel injection plunger member slidably extending into one end of said fuel chamber to adjacent said fuel supply port, an elastic substance supply space located adjacent the end of said piston valve member opposite the tapering disc end of the latter, means for remotely controlling the location of said fuel injection plunger member relative to said fuel supply port, means for supplying liquid fuel under a slight pressure to said fuel support port, means for supplying an elastic substance under a slight pressure to said elastic substance supply and compression spaces, means for actuating said actuating piston and piston valve member, means for compressing said elastic substance in said elastic substance compression space, means for separating said tapering disc and said tapering seat at a predetermined point in the travel of said actuating piston member, and means for displacing the compressed elastic substance from said elastic substance compression space and the liquid fuel from said fuel chamber and uniting and injecting them into said combustion chamber of such engine.

Users of

CITIES SERVICE LUBRICANTS

get an

EXTRA ADVANTAGE!



Heat-Prover Service is now available to users of Cities Service Industrial Fuels and Lubricants. This is an economy measuring service which you can secure in addition to the quality and economy advantages offered by Cities Service's SERVICE PROVED Fuel and Diesel Oils.

The Heat-Prover is an ingenious device—a by-product of our research in metallurgy. It registers continuously and instantaneously changes in the amount of oxygen and combustibles in furnace gases. It is an excellent guide in adjusting 4-cycle Diesels and for combustion control in heat generating plants. In the heat treatment of metals, it is invaluable. It assures uniformity and reduces scrap losses.

Let us tell you how you can secure the use of one of these machines. Mail the coupon today.

CITIES SERVICE DIESEL LUBRICANTS

FREE JUST CLIP AND MAIL

CITIES SERVICE OIL COMPANY
ROOM 1326, SIXTY WALL TOWER, NEW YORK

Please tell me how I can get Heat-Prover Service in my shop. D. P.

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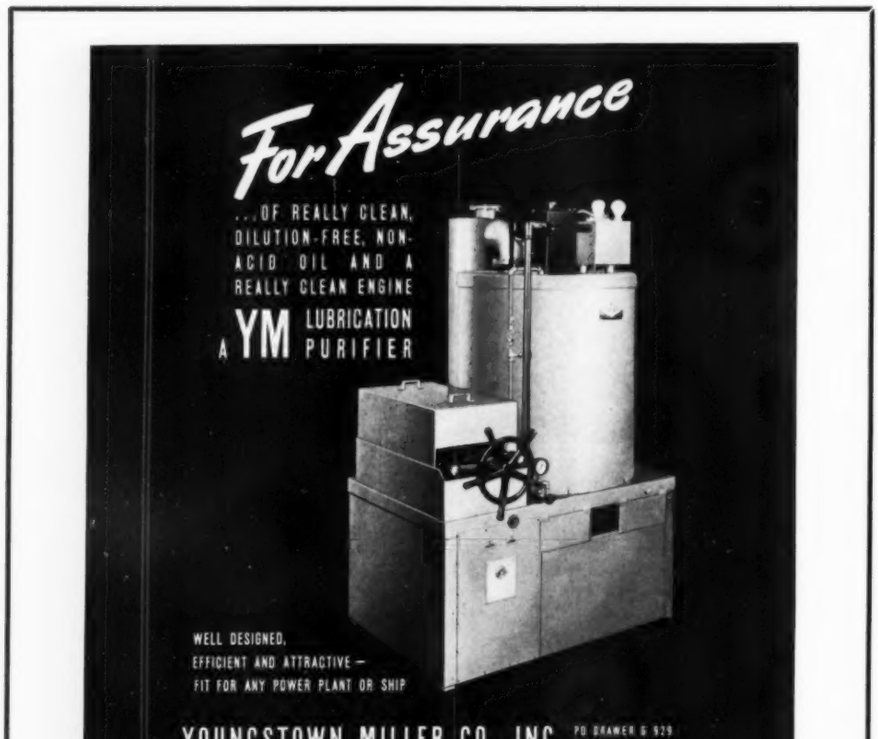
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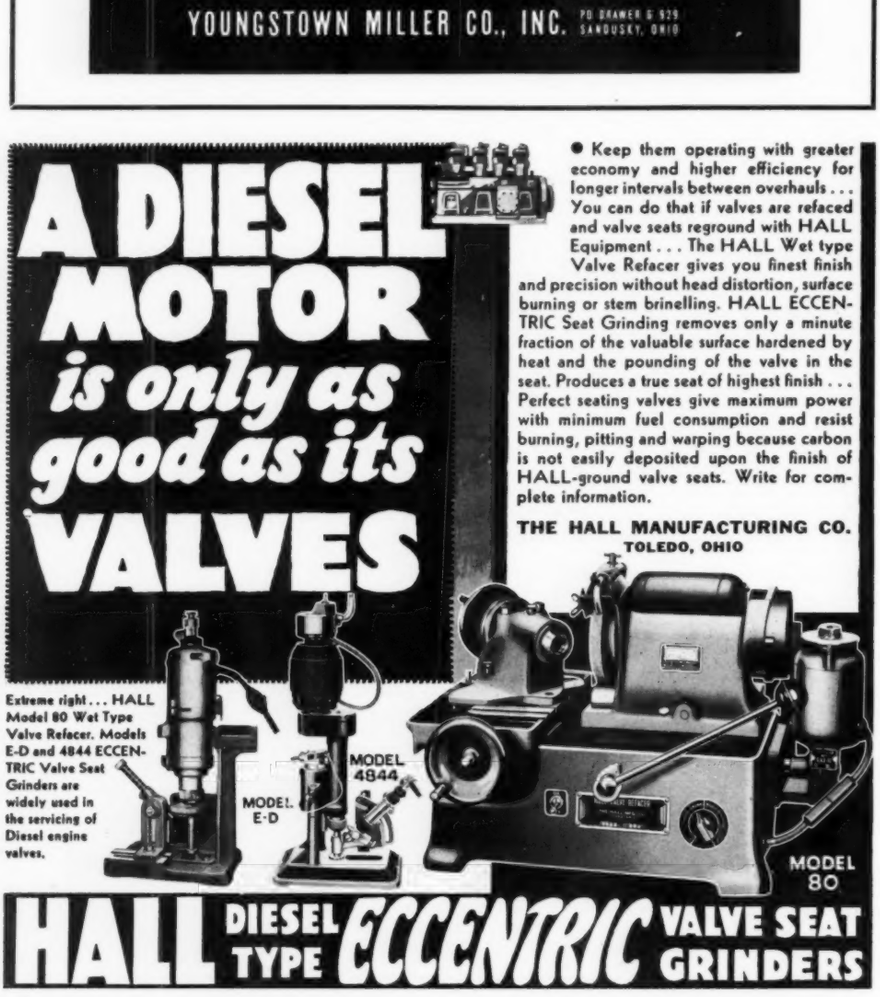
PO DRAWER G 929 SANDUSKY, OHIO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● Keep them operating with greater economy and higher efficiency for longer intervals between overhauls . . . You can do that if valves are refaced and valve seats reground with HALL Equipment . . . The HALL Wet type Valve Refacer gives you finest finish and precision without head distortion, surface burning or stem brinelling. HALL ECCENTRIC Seat Grinding removes only a minute fraction of the valuable surface hardened by heat and the pounding of the valve in the seat. Produces a true seat of highest finish . . . Perfect seating valves give maximum power with minimum fuel consumption and resist burning, pitting and warping because carbon is not easily deposited upon the finish of HALL-ground valve seats. Write for complete information.
THE HALL MANUFACTURING CO.
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MODEL E-D
MODEL 4844
MODEL 80
HALL DIESEL TYPE ECCENTRIC VALVE SEAT GRINDERS

2,204,570

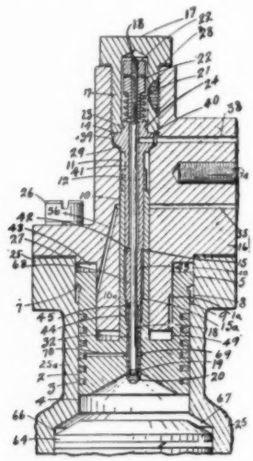
INTERNAL COMBUSTION ENGINE METHOD AND APPARATUS

Frank David Butler, United States Navy

Application August 18, 1937, Serial No. 159,696

10 Claims. (Cl. 123—139)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)



1. In association with an internal combustion engine, a liquid fuel atomizing and injecting assembly comprising in combination, a valve stem having a valve head to be exposed and open into the compression chamber of said engine, a stationary member surrounding said stem and having a small end adapted to be exposed in said chamber and serve as a seat for said valve head, also having a plurality of different sized plunger portions intermediate said small end and an opposite enlarged end portion, a movable member surrounding said stationary member and having a plurality of plunger chambers about said plunger portions, an oil cavity extending along and intermediate said stem and said stationary member near the enlarged end of the latter and having communication with a source of oil fuel supply and the larger of said plunger chambers, a second oil cavity extending along and intermediate said stem and said stationary member nearest the small end of the latter and having communication with the smaller of said plunger chambers, a resilient means retaining said valve head in contact with its seat, one end of said movable member being exposed to the pressure of said compression chamber whereby pressure in said compression chamber moves the movable member in relation to said stationary member to cut off communication between said oil cavities and entrap and compress oil fuel in said second oil cavity to thereby raise said valve head from its seat and inject some of said entrapped oil fuel into said compression chamber.

2,204,296

SCAVENGING OF THE CYLINDERS OF TWO-STROKE INTERNAL COMBUSTION ENGINES

Herbert Brooks, Yeovil, England, assignor to Petters Limited, Yeovil, Somerset, England, a company of Great Britain

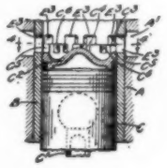
Application December 12, 1938, Serial No. 245,288

In Great Britain January 6, 1938

11 Claims. (Cl. 123—65)

4. A two-stroke cycle internal combustion engine including in combination a cylinder containing a piston and having formed therein a ring of scavenging ports adapted to be uncovered simultaneously by the piston towards the end of its outstroke, and a cylinder head

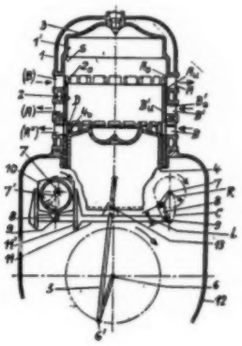
closing the end of the cylinder and containing at least one valve-controlled exhaust port, the scavenging ports being arranged symmetrically in the cylinder and so formed that the air entering the cylinder through the majority of



the scavenging ports is caused to flow in the same tangential direction to cause rotation of the charge as a whole about the cylinder axis while air entering the cylinder through each of the remaining scavenging ports is caused to flow substantially radially or in an opposite tangential direction so as to superimpose a general turbulence on the rotation of the charge as a whole.

2,199,314
TWO-STROKE INTERNAL COMBUSTION ENGINE
Werner Howald, Zurich, Switzerland
Application January 19, 1938, Serial No. 185,749
In Germany January 27, 1937
11 Claims. (Cl. 123—81)

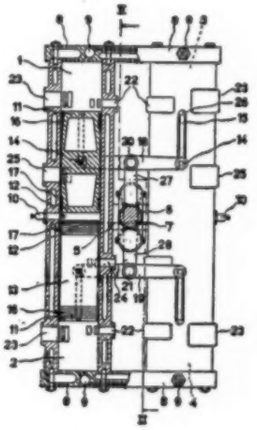
1. In a two-stroke internal combustion engine which includes at least one cylinder with inlet and outlet openings in the cylinder wall, a piston for said cylinder, a sleeve valve movably arranged between the cylinder wall and said piston, the said sleeve valve controlling at least part of the said openings in the cylinder wall, the sleeve valve fitting tightly along packing surfaces extending around the entire circumference of the sleeve valve and the inner surface of the cylinder wall, the said packing surface on the cylinder wall and the outer end of the sleeve valve being covered by a part of the piston wall when the piston is in the outer dead centre position, a radial projection of the cylinder wall arranged above the outer controlling edge of the sleeve valve and contracting the cylinder wall to a diameter corresponding approximately to the diameter of the sleeve valve bore, the sleeve valve forming with the radial projection a gap closed towards



the outside, and changing its width during the compression stroke and working stroke of the working piston, a part of the piston wall passing over the said gap when the working piston is attaining its outer dead centre position.

2,203,648
INTERNAL COMBUSTION ENGINE
Franciscus Cornelis Dons, Amsterdam, Netherlands
Application March 3, 1938, Serial No. 193,636
In the Netherlands March 30, 1937
1 Claim. (Cl. 123—51)

In an internal combustion engine the combination of: two cylinders arranged side by side and parallel to one another, two oppositely working pistons in each cylinder; and each cylinder having one combustion chamber at each end thereof and a third combustion chamber between the adjacent ends of the pistons therein; each piston being provided with outwardly projecting pins; transverse members connecting the pins of each piston in one cylinder with the corresponding pins of the



corresponding piston in said other cylinder; a crank shaft arranged externally of and between said cylinders parallel to said pins; and connecting rods connecting said transverse members with cranks of said crank shaft.

2,198,979
ANTECHAMBER DIESEL ENGINE WITH READJUSTABLE CONTROL BODY
Karl Schwaiger, Gaggenau/Baden, Germany, assignor to Daimler-Benz Aktiengesellschaft, Stuttgart-Unterturkheim, Germany
Application December 30, 1936, Serial No. 118,311. In Germany January 8, 1936
23 Claims. (Cl. 123—32)

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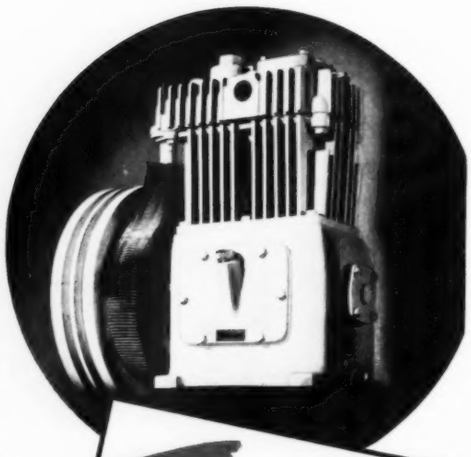

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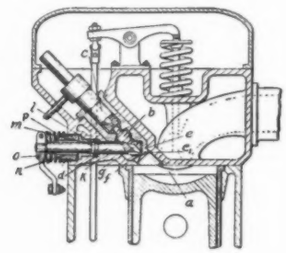
1. In an internal combustion engine having a main combustion space and a precombustion chamber connected therewith, in combination, an injection nozzle for injecting fuel into said precombustion chamber, an adjustable throttling member between the precombustion chamber and the main combustion space, said member so constructed and arranged as to permit free injection of the fuel therethrough for starting the engine and passage of the fuel during the operation of the engine only through transverse throttling sections, said throttling member extending into the precombustion chamber, and means removed from the hot gases of the main combustion space and mounted outside of said precombustion chamber for the sole support of said throttling member in said precombustion chamber.

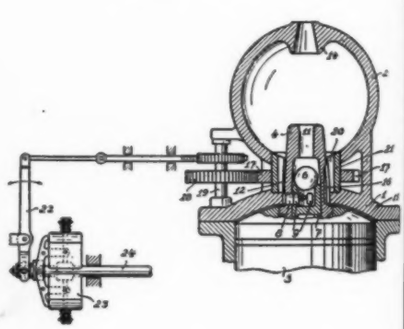


2,197,106

INTERNAL COMBUSTION ENGINE WITH SEPARATE COMBUSTION CHAMBERS

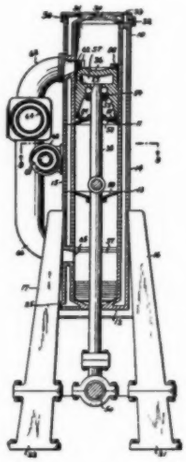
George Stephen Kammer, Budapest, Hungary

Application July 18, 1938, Serial No. 219,912
In Germany June 20, 1938
3 Claims. (Cl. 123—33)



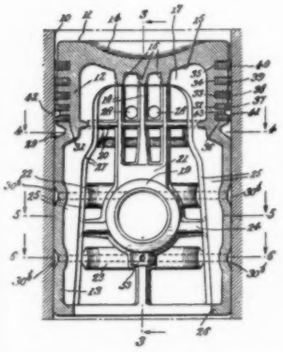
1. An internal combustion engine comprising a working cylinder, a piston movable therein, a combustion chamber separate from the cylinder, a member located between said combustion chamber and the cylinder and providing a single large communication passage interconnecting these two spaces, said member being rotatable on the axis of the communicating passage and having at least one longitudinal groove on its inner surface, a tapered plug mounted on the piston, and located to enter the communicating passage when the piston is approaching the inner dead center, said plug having an internal passage and a non-return valve therein permitting flow from the cylinder to the combustion chamber, but not in the reverse direction, the communication between the cylinder space and the combustion chamber being thus substantially unrestricted as long as the piston is near its inner dead center, the throttling being released at a predetermined rate when the piston is moving away from the inner dead center, one longitudinal groove arranged on the plug and adapted to enter into register with the groove on the rotatable member to a varying extent determined by the rotatable position of the latter.

2,193,576
DOUBLE ACTING DIESEL ENGINE
Karl Torjussen, Brooklyn, N. Y.
Application May 9, 1939, Serial No. 272,546
4 Claims. (Cl. 123—61)



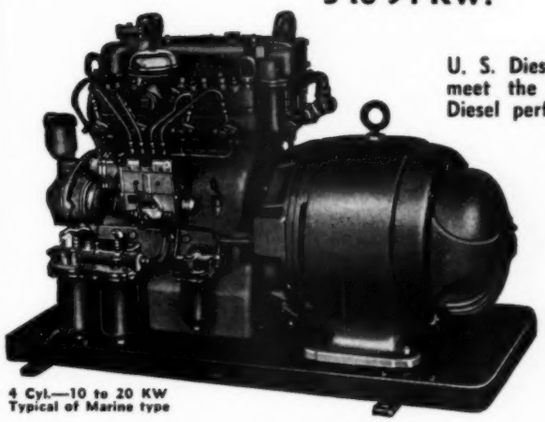
1. In a double acting internal combustion engine the combination of a lower cylinder with its head toward the crank shaft; an upper cylinder located in line with the lower cylinder but with its head in the opposite direction, said cylinders having a plurality of mounting ears; a piston in each cylinder; a common piston rod connecting the two pistons; a cross pin extending longitudinally to both sides from said piston rod; a crank shaft journalled at one end of said cylinder; a forked connecting rod tying in said cross pin to said crank shaft; a plurality of spacer blocks placed between said two cylinders, said blocks having holes for mounting bolts; a frame structure located on both sides of the lower cylinder; a plurality of mounting bolts whereby said cylinder blocks and spacers may be fastened to the frame; an end-closure closing each of the open ends of the two cylinders, and an automatic pressure operated air intake valve, one side of said valve being connected to the space between the piston and said closure in the upper cylinder, and the other side of the valve being connected to the corresponding space in the lower cylinder.

2,195,552
HEAVY DUTY PISTON
Alexander M. Alexandrescu, Cleveland, Ohio
Application July 23, 1937, Serial No. 155,310
Renewed February 5, 1940
3 Claims. (Cl. 309—7)



1. An improved piston comprising a top wall, ing column, skirt, and bosses extending inwardly from said skirt and leaving free wall

"U.S." DIESEL
ELECTRIC PLANTS
3 to 94 KW.



4 Cyl.—10 to 20 KW
Typical of Marine type

U. S. Diesel Electric Plants are built to meet the highest standards of modern Diesel performance. Safety . . . smooth running . . . easy starting . . . and economical operation — are the *plus values* which you get in a U. S. Diesel Electric Plant. One, two, four and six cylinder models, 3 to 94 KW. Complete lines for both marine and land service. Write for full information.

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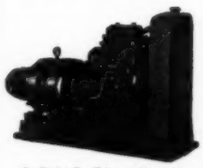
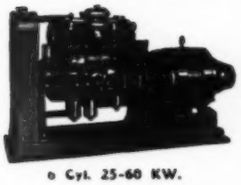


2 Cyl. 5, 7½, 10 KW.



6 Cyl. 25-60 KW.

94 KW.

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BELOW RIGHT: *Twin Disc Model E Heavy-duty Clutch*

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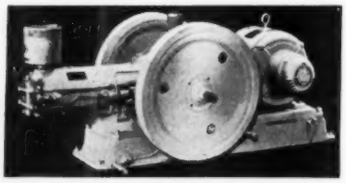

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portions of the skirt therebetween, said ring column and skirt having vertical groups of spaced apart ribs, said groups being mounted in diametrically opposite pairs, one pair of ribs having its lower end portions merging with said bosses, the other pair of groups of vertical ribs lying in the free sides of said piston and extending from end to end of the piston, said ring column having an internal substantially horizontal annular rib at its lower portion intersecting said vertical ribs, said ring column having an external oil groove lying below said annular rib, said ring column having therein openings above said annular rib, oil and compression rings carried by said ring column, said ring column having a radially reduced portion between the oil ring and the next compression ring and with an undercut portion therein to form an annular chamber between said rings in communication with said openings.

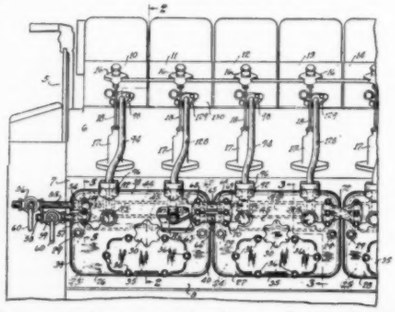
2,189,163

AIR-START MEANS FOR INTERNAL COMBUSTION ENGINES

Hugo F. Budzien, Peoria, Ill., assignor to Fairbanks, Morse & Co., Chicago, Ill., a corporation of Illinois

Application March 1, 1937, Serial No. 128,330

6 Claims. (Cl. 60—16)



1. In an air start system for an internal combustion engine, a pair of trunk conduits of sectional construction, each arranged along the engine to an extent to serve the air start cylinders thereof, a valve for each of said conduits controlling the admission of air thereto, an air distribution valve for each cylinder, connected thereto and supplied from one of said conduits, each of said conduits including means for interconnecting the sections thereof, in straight or crossed relation whereby, through the addition or removal of sections the sectional conduit structure is adapted for application to engines of different number of cylinders and different firing order, each of said conduit sections being of an extent to serve a pair of adjacent engine cylinders and being provided with air distribution valve connections such that said valves of adjacent cylinders are connected to different conduit portions.

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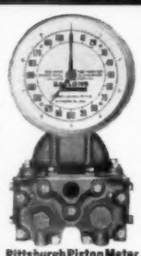
There is only one accurate way to measure the oil consumed by Diesel engines—by meter. Diesel power requires accurate meter records to prove its economy.



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36, 60, 125, 250 Volts
Shunt or Compound Wound.

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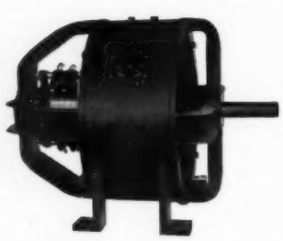


COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave., Cleveland, Ohio

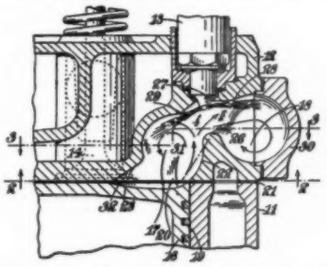
2,204,068

INTERNAL-COMBUSTION ENGINE OF THE FUEL-INJECTION COMPRESSION-IGNITION TYPE

Charles Wallace Chapman, Peterborough, England, assignor to F. Perkins Limited, Peterborough, England, a British company

Application May 24, 1939, Serial No. 275,417
In Great Britain July 14, 1938
2 Claims. (Cl. 123—32)

1. In an internal combustion engine of the type described, the combination of an engine cylinder, a head therefor, first and second swirl-type combustion chambers close together in the head, the first of said chambers communicating directly with the cylinder through a port so located that gases entering said chamber from the cylinder swirl around the walls of the chamber, the said chamber having also a transfer port between the chambers spaced from said first port along the wall of said first chamber so that gases circulating in the first chamber may divide and part of them pass into the second chamber and swirl therein, and a fuel injector the tip of which is located within the



chambers at said transfer port approximately between the paths of the gases where they are divided and having jets to direct fuel in two directions one with the stream of gas circulated in the first chamber and the other with the stream of gas circulated in the second chamber.

FIVE DIESEL LOCOMOTIVES

First time in railroad history! Veteran railroad men say that this photograph of five Diesel passenger locomotives, taken recently in the Washington, D. C., yards of the Washington Terminal Railroad Company, is the first time in railroad history that the locomotives of five different railroads have been photographed in one picture. All five were built by General Motors, and all are regular visitors to the National Capital. From left to right, they belong to the following railroads: Florida East Coast, Atlantic Coast Line, Seaboard, Southern and Baltimore & Ohio. Washington is now one of the most important Diesel locomotive railroad centers in the United States.

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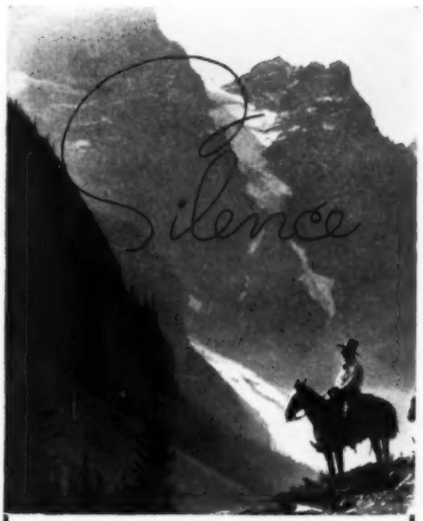

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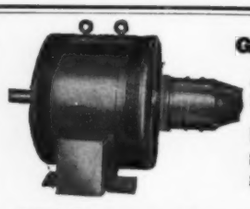

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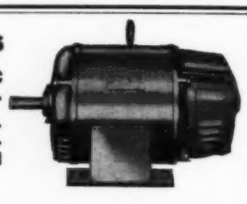
AC and DC
3 to 150 kw.

For Diesel and gasoline engine drive

MOTORS

AC and DC
¼ to 200 hp.

For all applications Stationary and Marine



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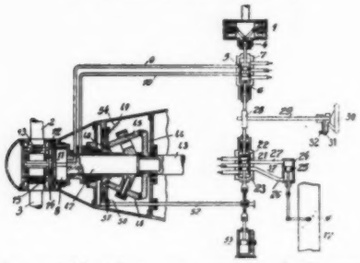
2,178,120

AIRCRAFT ENGINE CONTROL

Fritz Gosslau, Berlin-Charlottenburg, and Johannes Schmidt, Berlin-Eichkamp, Germany, assignors to Siemens Apparate und Maschinen (Gesellschaft mit beschrankter Haftung), Berlin, Germany, a corporation of Germany

Application April 4, 1936, Serial No. 72,834
In Germany April 30, 1935
6 Claims. (Cl. 170—135.6)



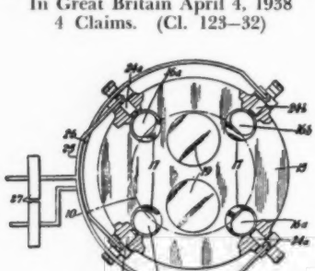
1. In combination, an engine, fuel supply means therefor, an operating shaft driven by said engine and driving an adjustable pitch propeller, hydraulic motor means for adjusting the pitch of the blades of said propeller, hydraulic motor means for adjusting said fuel supply means, separate hydraulic pitch control and fuel control means, respectively, for controlling said motor means, common operating means for determining the setting of said hydraulic control means, and separate auxiliary means for governing the actuation of said hydraulic control means according to the speed of said engine and according to the torque of said operating shaft, respectively.

2,195,709

FUEL-INJECTION ENGINE

Arthur Freeman Sanders, Leeds, England, assignor of one-half to John Fowler & Co. (Leeds) Limited, Leeds, England

Application April 17, 1939, Serial No. 268,386
In Great Britain April 4, 1938
4 Claims. (Cl. 123—32)



1. In a fuel injection engine, a cylinder, a piston adapted to reciprocate in the bore of

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3. Sleeve cylinders.
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5. Reversible shell type silver alloy bearings.
6. Individual pump for each cylinder.
7. Completely enclosed.

They insure long life, high efficiency, low maintenance—all meaning lower power costs. Write for catalogs on your letter-head.

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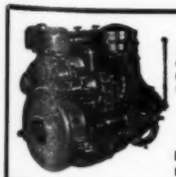

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Based on the Engine developed and built by General Motors, adapted and equipped for marine use by Gray.
1 to 6 cylinders, 25-165 H.P.
Both Rotations
Reduction Ratios to 4.4:1
Fresh water cooling is standard
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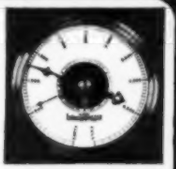
CHECK YOUR FUEL SUPPLY AT A GLANCE



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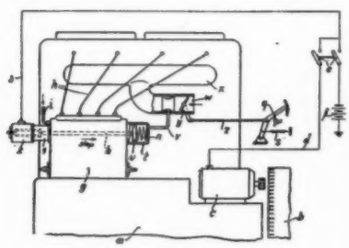
said cylinder, a cylinder head having a pair of diametrically opposite compression chambers therein, the cylinder having at the top thereof removed portions providing downward extensions of said compression chambers, said compression chambers communicating by a relatively large opening of no axial length with the cylinder bore fuel injection means for one of said chambers, and fuel injection means for the second chamber timed to inject fuel consecutively with respect to injection in said one chamber in each engine cycle the firing of the mix in the first chamber increases turbulence and compression in the second chamber to effect optimum fuel combustion.

2,195,927

STARTING ARRANGEMENT FOR FUEL INJECTION INTERNAL COMBUSTION ENGINES

Max Hurst, Stuttgart, Richard Hammer, Winnenden, and Ernst Raithelhuber, Duren, Germany, assignors to Robert Bosch Gesellschaft mit beschrankter Haftung, Stuttgart, Germany

Application March 3, 1938, Serial No. 193,796
In Germany March 10, 1937
11 Claims. (Cl. 123—179)



1. A starting arrangement for fuel injection internal combustion engines, including in combination an electric starter, an injection pump having a control rod, a stop to limit the displacement of said rod to correspond to the maximum quantity of fuel delivered for normal engine running, electromagnetic means to displace said stop from said limiting position to allow excess fuel to be delivered, an electrical circuit for supplying current to said starter and said electromagnetic means, and an electric switch in said circuit controlling the said starter and said electromagnetic means.